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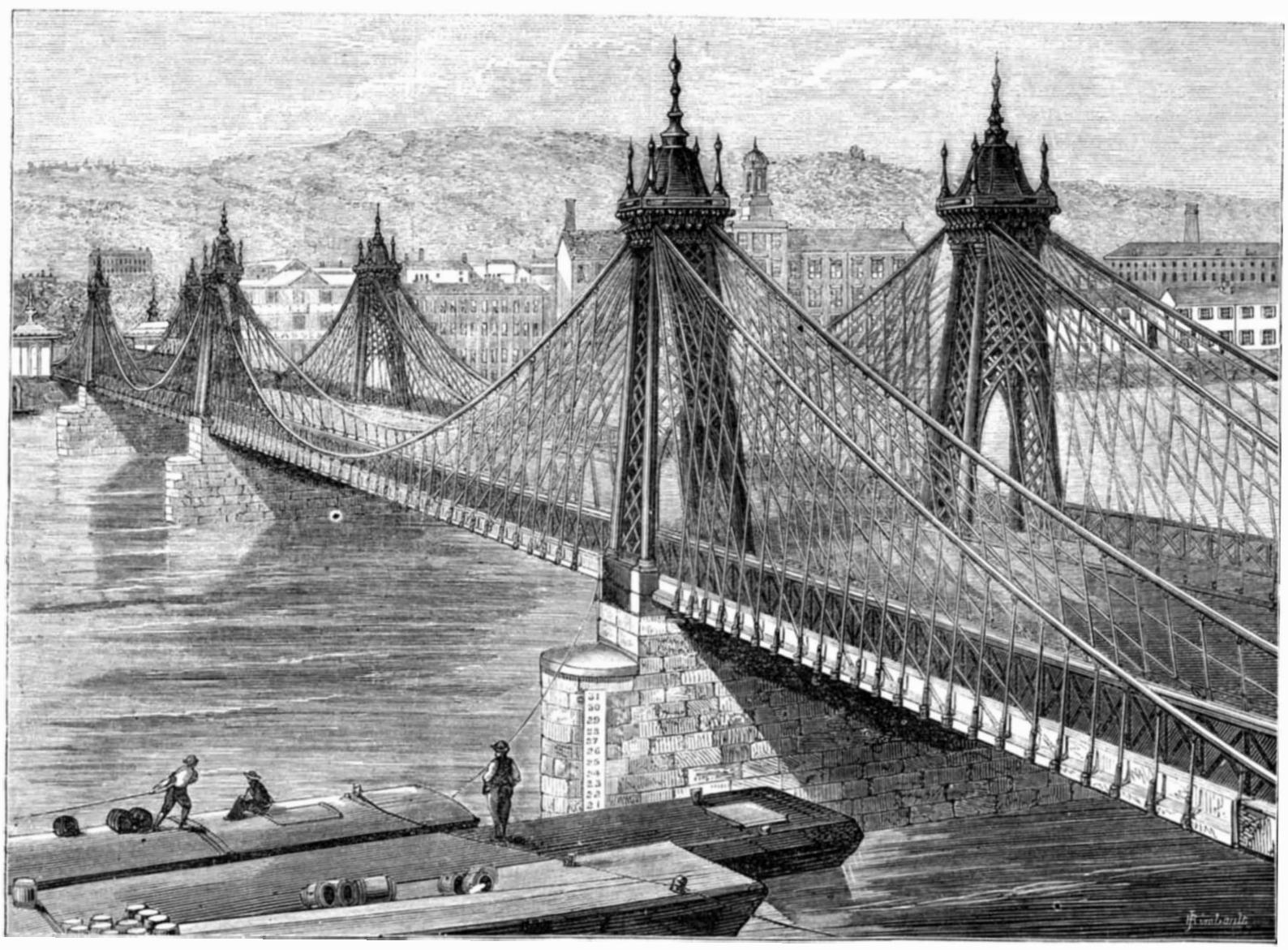
The Alleghany Bridge at Pittsburgh, Pa.

We believe we express a general opinion among engineers and architects when we say that the bridge which forms the subject of our first page engraving this week, is one of the most elegant structures of its class on this continent. Nothing can exceed the grace of its outline when seen from a favorable point of view. Our engraving, which we reproduce from the *Building News*, gives an excellent idea of this beautiful bridge, which was designed and erected in 1860, by the late John A. Roebling, who lived to erect many such monuments to his great genius, but lost his life from an accident received while surveying the approaches to his last and greatest design, the East River Bridge, now in process of construction, under the able supervision of Mr. Washington A. Roebling, who, it is said, inherits his father's genius.



SUSPENSION BRIDGE OVER THE ALLEGHANY RIVER AT PITTSBURGH, PA.

The bridge we illustrate crosses the Alleghany about half a mile above its junction with the Monongahela, both of which streams, when united, form the Ohio. The town of Pittsburgh is situated on the promontory made by the convergence of these two rivers, and has, with its suburbs, a population of about 200,000. The distance between the abutments of the bridge is 1,037 feet 5 inches, being divided into two main spans of 344 feet 6 inches each, one half span of 117 feet 5 inches, and a second half span of 171 feet. Four wire cables carry the structure; the two outer ones incline outwards from the towers, and the two inner inwards, to give stability to the bridge. The lighter cables which carry the footway are each 4½ inches diameter, that of the others being 7½ inches. The roadway is 20 feet wide, and the footways each 10 feet. The cables are attached to bell cranks at the towers, instead of by saddles placed upon rollers—a by no means satisfactory arrangement—the vibration of the bridge being increased perceptibly by the lightest passing load. The towers are about 45 feet high. They are of cast-iron, and of an ornate character, the weight they support being entirely carried by the four inclined columns, which are braced together by latticed castings.

Selecting Durable and Perishable Timber.

Todd, in his "Country Homes," makes the following excellent remarks upon the selection of timber:

Many persons could save a vast deal of labor and money, when making preparations to build if they were familiar with the durability of all kinds of materials. Many a farmer has incurred the expense of hauling pine and hemlock lumber twenty or thirty miles, when his own wood lot would have furnished all the timber required. I have known farmers to pay an extortionate price for pine plank for a barn floor, when they could have procured "clear-stuff" basswood on their own land, at less than half the expense of pine. Besides this, good basswood will make beautiful floors for any outbuilding or dwelling, where the floor is not exposed to the influences of wet and heat.

In many localities, durable timber for fence posts or for sills to a building is exceedingly scarce. And yet, there are so many varieties of durable timber that, if oak of any kind can not be obtained, some other kind of timber may be had which will be found quite as durable as oak. Red elm, if seasoned before the timber is employed for fence posts, will last quite as long as oak. When red elm is employed as sills for a building, as the newly hewed sticks are liable to warp and spring, the timber should be hewed, framed, put in its place, and protected from the sun all in one day, if practicable. In case red elm timber can not be secured in a frame soon after it is sawed or hewed out, every stick should be placed on a level foundation, so that stones or heavy timber may be laid above it to hold it straight. Red beech is another kind of durable timber, which will serve satisfactorily for sills of buildings, or for posts or beams, where the timber is liable to be exposed to dampness or the influences of wet and heat. Red beech will be found an excellent substitute for oak. As this kind of timber rarely grows where we find oak forests, it may be sawed into all kinds of timber for dwelling houses or outbuildings. It will make joists, studs, and excellent floor boards, provided they are "stuck up" straightly soon after the logs are sawed, so that the pieces may have an opportunity to season straight without being warped by the sun. Butternut is another kind of timber that is often more durable than any oak, even when employed for fence posts. Butternut is usually a soft wood, often softer than white pine. Therefore, this kind of timber may be employed for roof boards, for flooring, for casing and window sills, or for making doors Yet, as butternut timber is so liable to warp and spring, when the pieces are seasoning, it is always important that this kind of lumber should be stuck up while the timber is green, that it may be straight after the pieces are well seasoned. The grain is as beautiful, that a parlor finished with butternut lumber often looks richer than if wainscoted with the best black walnut. Many a man has purchased black walnut, at an exorbitant price, for making a hand-rail and balusters for his stairs, or for other work in his house, when there were large butternut trees on his own land which would have furnished ten times more lumber than he required, and that, too, of a superior beauty.

A common error is frequently committed in selecting durable building timber for dwelling houses and out-buildings, and then choosing perishable timber for sleepers or cross sills, though the main sills may have been procured of the best quality, at a large expense. We frequently see white oak, or red elm sills, and sleepers of sugar maple, which will decay as soon as basswood or buttonwood. When the ends of sleepers are received in gains cut in the sills, the very ends are more liable to decay than any other part, especially if water is allowed to find its way down in the joints. For this reason, it is always quite as important to select durable timber for joists and sleepers as for sills. But when the sills of a building are resting on a high wall, where the timber will be exposed to the alternate influences of moisture and dryness, almost any kind of wood may be employed; and so long as water can be kept from the surface, from cracks and from mortises, even perishable timber will remain quite sound. Basswood, white beech, maple, and other kinds of timber that are known as perishable, will satisfactorily serve these purposes, and continue sound so long as the sticks can be kept dry.

In numerous instances, persons who have many acres of oak, chestnut, and other durable timber, near by, have gone thirty miles to purchase hemlock scantling and boards for building a barn, when either of the kinds mentioned would have subserved a more satisfactory purpose, and would not have cost one half so much. Oak and chestnut will make excellent roof boards, or vertical boards for any outbuilding. I have in mind a barn that was covered with basswood boards, put on vertically, in 1832, and they are good for another thirty years. Had the boards been seasoned, planed, and painted, as they should have been before they were used, they would have been quite sound at the present writing. I have met with many large barns, at the West, which were built wholly of oak.

PAPER was first made from linen in the year 1302.

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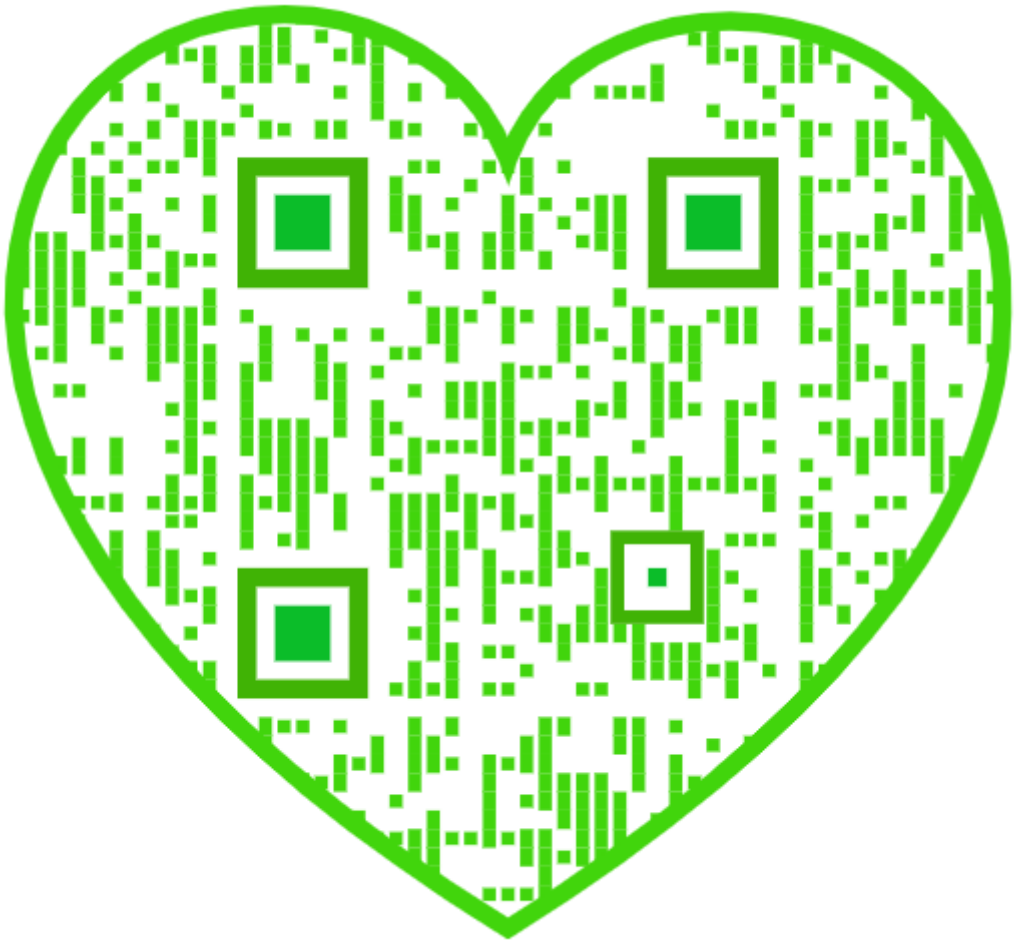

SCIENTIFIC INTELLIGENCE.

BROMIDE OF SODIUM.

According to the testimony of physicians this salt is more effective than the bromide of potassium, and hence a cheap way for its preparation has become desirable. Mr. Castelhaz prepares, in the first place, bromide of ammonium by causing bromine to fall drop by drop into dilute, but pure liquid ammonia contained in a series of Wolff's bottles. The liquids after saturation are evaporated in a cast-iron retort, to which an earthenware receiver is fastened, to catch any of the volatile products that may go over.

The bromide of ammonium thus obtained is converted into bromide of sodium by being mixed with pure carbonate of soda, and the carbonate of ammonia produced by the reaction is expelled by heat. Perfectly pure and anhydrous bromide of sodium can be prepared in this way.

CHEMICAL PRIZE OFFERED.

The great confusion that now obtains in the nomenclature of chemistry and in the construction of formulas, has led to the offer in Göttingen of a prize for a new and exact determination of the atomic weights of the metals of the earths, with indication of the limits of errors of the experiments made and a review of the labors of other authors in this direction. The author of the thesis must discuss the question whether the hypotheses of Prout and Dumas are to be retained or rejected, and whether any differences in them can be explained on chemical or physical grounds. The first prize is of the value of £75, and the second of the value of £30, to be awarded on the 11th of March, 1873. Essays in German, French, English, or Latin may be forwarded to Dr. Müller at Göttingen.

SULPHO-CYANIDE OF AMMONIUM.

This salt has been used as a delicate test for iron, and to some extent in photography. It is now proposed to employ it to produce a sudden reduction of temperature. When a considerable quantity of the salt is dissolved in water at 208° Fah., the temperature sinks rapidly to 28° Fah., showing a change of temperature of 180° Fah.

If this salt could be obtained in large quantities it would doubtless find a large consumption for artificial freezing mixtures. At present its manufacture and application are limited, and it is hardly used for any other purpose than those indicated above.

INFLUENCE OF IRON ON WATER.

It is not generally known that a few scraps of iron will prevent the bad odor from forming in water left to stand for days and weeks. The metal removes the free oxygen in the water, and thus prevents the oxidation of the organic matter that may be in the water.

A better agent for rendering river water sweet and healthy is to employ chloride of iron. A very small quantity suffices to throw down the organic matter and thus to purify the water. There are few disinfectants so valuable as the chloride and the sulphate of iron, and they ought to be kept about every household. They are equally important to stop bad cases of bleeding from the nose or from cuts.

A NEW WASH FOR WOOL AND SILK.

Instead of using the fumes of sulphur, M. Frezon proposes the following mixture: 4 lbs. oxalic acid, 4 lbs. table salt, 200 quarts of water. The goods are laid in this mixture for an hour. They are then generally well bleached, and only require to be thoroughly rinsed and washed. For bleaching straw it is best to soak the goods in caustic soda and afterwards to make use of chloride of lime or Javelle water. The excess of chlorine is afterwards to be removed by hyposulphite of soda, called anti-chlor.

American Inventions in England.

A correspondent of the *New York Times* writes that England is not specially wide awake to the introduction of new industries, but a gentleman advertises a book under the title of "Seventy Pounds a Year; How I Make it by my Bees;" and another, who has been engaged for a few years in rearing silk worms in Devonshire, calculates that a hundred acres of land will give an average net profit of $50 an acre. The science of keeping silk worms by means of artificial heat and ventilation has been brought to great perfection. There is also a movement for the cultivation of beet sugar in Southern England and Ireland, and county Cork has some hopes of being permitted to supply the United Kingdom with tobacco.

American inventions are taken up with more readiness than most others, for it is now very thoroughly impressed upon the British mind that we are an ingenious people. Birmingham, for instance, is going into the manufacture of screws in the American style on a large scale, and some time since adopted the iron pins. Cramer, in London, has copied some of the improvements in the American harmoniums, and boasts that he can furnish them forty-five per cent less in price, on account of the greater cheapness in labor and materials. The American street railways, with beautiful cars, made by Stephenson, of New York, have begun to run in London, and in a few months they will radiate to every suburb of the metropolis. On the opening day crowds collected to see them start, and for the first trips they were allowed to pile on in the New York fashion; but after that day no person will be allowed to stand, and the conductor will be prosecuted if he ever exceeds, inside or out, the regulation number. This rule is everywhere strictly enforced. Asphalt pavement is, I believe, a Parisian luxury; but it has been tried with great success—granite laid in asphalt—in some of the most heavily worked streets in London. The stones are solid, unworn, and there is neither mud nor dust.

Strange Noises Heard at Sea off Grey Town.

A correspondent of *Nature* vouches for the recent occurrence of a phenomenon of which we have heard before, but have always regarded as doubtful, as the persons who made the statement were not in our opinion reliable observers. He says:

"I am guided only by the desire of seeking a solution of what to me and to many others appears a very curious phenomenon. The facts related can be vouched for by numbers of the officers and crews of any of the R. M. Company's ships.

"I must premise that this phenomenon only takes place with iron vessels, and then only when at anchor off the port of Grey Town. At least, I have never heard of its occurring elsewhere, and I have made many inquiries.

"Grey Town is a small place, containing but few inhabitants, situated at the mouth of the river St. Juan, which separates Nicaragua from Costa Rica, and empties itself into the Atlantic, lat. 10° 54′ N., and long. 83° 41′ W. In this town there are no belfries or factories of any kind.

"Owing to a shallow bar, vessels cannot enter the harbor or river, and are therefore obliged to anchor in from seven to eight fathoms of water, about two miles from the beach, the bottom consisting of a heavy dark sand and mud containing much vegetable matter brought down by the river. Now, while at anchor in this situation, we hear, commencing with a marvelous punctuality at about midnight, a peculiar metallic vibratory sound, of sufficient loudness to awaken a great majority of the ship's crew, however tired they may be after a hard day's work. This sound continues for about two hours with but one or two very short intervals. It was first noticed some few years ago in the iron-built vessels *Wye, Tyne, Eider,* and *Danube.* It has never been heard on board the coppered-wooden vessels *Trent, Thames, Tamar,* or *Solent.* These were steamers formerly employed on the branch of the Company's Intercolonial service, and when any of their officers or crew told of the wonderful music heard on board at Grey Town, it was generally treated as "a yarn" or hoax. Well, for the last two years the company's large Transatlantic ships have called at Grey Town, and remained there on such occasions for from five to six days. We have thus all had ample opportunity of hearing for ourselves. When first heard by the negro sailors they were more frightened than astonished, and they at once gave way to superstitious fears of ghosts and Obeahism. By English sailors it was considered to be caused by the trumpet fish, or what they called such (certainly not the *Centriscus scolopax,* which does not even exist here). They invented a fish to account for it. But if caused by any kind of fish, why only at one place? and why only at certain hours of the night? Everything on board is as still from two to four, as from twelve to two o'clock, yet the sound is heard between twelve and two, but not between two and four. The ship is undoubtedly one of the principal instruments in its production. She is in fact for the time being converted into a great musical sounding board.

"It is by no means easy to describe this sound, and each listener gives a somewhat different account of it.

"It is musical, metallic, with a certain cadence, and a one-two-three time tendency of beat. It is heard most distinctly over open hatchways, over the engine-room, through the coal shoots, and close round the outside of the ship. It cannot be fixed at any one place, always appearing to recede from the observer. On applying the ear to the side of an open bunker, one fancies that it is proceeding from the very bottom of the hold.

"Very different were the comparisons made by the different listeners. The blowing of a conch shell by fishermen at a distance, a shell held to the ear, an æolian harp, the whirr or buzzing sound of wheel machinery in rapid motion, the vibration of a large bell when the first and louder part of the sound has ceased, the echo of chimes in the belfry, the ricocheting of a stone on ice, the wind blowing over telegraph wires, have all been assigned as bearing a more or less close resemblance; it is louder on the second than the first, and reaches its acme on the third night; calm weather and smooth water favor its development. The rippling of the water alongside and the breaking of the surf on the shore are heard quite distinct from it.

"What is, then, this nocturnal music? Is it the result of a molecular change or vibration in the iron acted on by some galvanic agent peculiar to Grey Town? for bear in mind that it is heard nowhere else, not at Colon, some 250 miles distant on the same coast, not at Porto Bello, Carthagena, or St. Marta. The inhabitants on shore know nothing of it. If any of your numerous readers can assign a likely cause, will they be pleased to state by what means, if any, its accuracy may be tested? If required, I can forward a specimen of the mud and sand taken from the anchor."

Sulphur in Street Gas.

Mr. Henry Wurtz, the editor of the American *Gaslight Journal,* has noticed within his experience, more than one instance in which gas as delivered to consumers tinged lead paper strongly, and was complained of as malodorous, whereas at the works the purification was apparently managed with care, and the gas directly from the purifiers sweet. He has been induced to believe that some of the sulphureted compounds known to exist in gas, which do not tinge the test paper and are not taken out by iron or even by lime, may undergo afterwards *spontaneous* decomposition, with formation of sulphureted hydrogen or rather of sulphide of ammonium, and he does not now resign this belief; but what he now wishes to ask of our gas managers is whether the following does not indicate one method by which such a result could readily occur, without constant and competent *chemical* supervision or inspection of their purifying operations; and has not this accident often led to inexplicable, annoying, and *persistent* complaints on the part of their customers? The extract is from the evidence of that eminent gas-chemist, Dr. Letheby, before an English Parliamentary Commission, given April 1, 1870, and relating to a case of this kind, similar to the one he cites from his own experience, which occurred at Rotherham, and which was investigated by another chemist, Mr. A. H. Allen. Dr. Letheby says:

"I am the chief gas examiner appointed by the Board of Trade for the metropolis. I have heard Mr. Allen's evidence. Last October, the gas supplied by the Great Central Gas Company showed a quantity of sulphureted hydrogen, which, from an accident, had been absorbed by the water in the tank, and it took four months to eradicate it. I therefore exonerated the company from the fines to which they were liable. If, from the purifier not acting, foul gas gets into the gas-holder, it so taints the water that sulphureted hydrogen may exist in the gas for a long time. The results of Mr. Allen's examinations show a very small proportion of sulphur. In London there are frequently 20 grains in 100 feet. The ammonia in the gas at Rotherham is also very low, as 5 grains are considered a fair quantity. Copperas is quite a proper material for use in purification, if properly managed; but unless used with sawdust there may be accidents."

American Quercitron and Sumac.

Alex. S. Macrea, Anglo-American Produce Broker at Liverpool, England, sent out circulars last fall, showing the value of these two articles of commerce. Of sumac he states that Liverpool frequently imports from Sicily 6,417 bags in a day, and exports to America in one day 1,200 bags, and then goes on to explain the utter fallacy of our permitting such a foolish work. He says that from actual experiments, the American sumac contains from 10 to 20 per cent more tannin than any other, and yet we import the product of other countries. Mr. Macrea asserts that we should be reaping the benefit of selling thousands of tuns of this article, at $125 per tun, instead of importing the same, as it grows in great quantities in Maryland, Virginia, and other States. Of quercitron (ground black oak bark), he says:

"Our chief supply of quercitron has, ever since its general introduction fifty years ago, reached us from Philadelphia and Baltimore, with occasional consignments from New York. Philadelphia bark comes in hogsheads, as is well known, and from the fact that in Philadelphia it is branded 'first sort,' and must consequently be up to the mark in quality, gives a reputation to that port, which no other rivals. Baltimore comes in bags, and most of it is intrinsically the same as that which comes from Philadelphia, but from the fact that it is not so carefully ground or packed, fetches, as will be seen by the quotations, a much lower price: 1st Philadelphia, in hogsheads, $60 per tun. 1st & 2d Baltimore, in bags, $35 to $45 per tun.

"As this article abounds in untold quantities in Maryland, Pennsylvania, Virginia, etc., and as the consumption in Europe is enormous, it may be well to call attention to a 'new feature,' which will give more general employment, and benefit everybody. The 'new feature' is to send the bark 'pulverized' like flour or florine. This attained, port of shipment or place of production makes no difference, whereas the value increases to $70 or $80 per tun. Indeed, in the first instance, I myself made $90 per tun, and fully believe in perpetuity this will be a nearer value. Wherever bark or sumac mills abound, their present machinery can readily be adjusted to do the work of fine 'grinding;' when nothing remains but its being packed in hogsheads lined with paper, and shipped to England from any contiguous port. The consumption will be largely increased."

Application of Picric Acid for Imparting to Ivory, Bone, and Horn a Beautiful Red Color.

According to C. Mène the following recipe will impart the required color. Take 4 grms. of picric acid, and dissolve in 250 grms. of boiling water; add, after cooling, 8 grms. of liquid ammonia. Dissolve also 2 grms. of crystallized fuchsine (magenta) in 45 grms. of alcohol, dilute with 375 grms. of hot water, and next add 50 grms. of ammonia. As soon as the red color of the magenta solution has disappeared, the two solutions are mixed together, making a bulk of liquid amounting to about ½ liter, which is a sufficient quantity for dyeing from four to six sheep's-skins. Ivory and bone should be placed in very weak nitric or hydrochloric acids first, before being immersed in the ammoniacal liquid; wood cannot be dyed by this liquid, unless it has been previously painted over with paste made from flour. When, to the ammoniacal liquid, some gelatin solution is added, it may serve as a red ink which does not attack steel pens. By varying the proportions of the magenta and picric acid, the tints obtained may be varied from a bluish red to a bright orange red. The desired colors do not appear until the ammonia is evaporated.

A PECULIAR branch of industry flourishes in the Muldenthal, Germany, between Zwickau and Glauchau. This is the growing of willows for basketmakers. The dearest sort, the green osier, goes chiefly to Bavaria, and is there used for basket-work. The coarser sort is made into ordinary baskets, etc., in the valley where it is grown. The acre of willows brings in about a hundred dollars, but requires a great amount of care and work in its cultivation. This industry has been carried on there ever since the twelfth century.

INVENTORS and others visiting the National Capital will find the St. Cloud Hotel, corner 9th and F. St., near the Patent Office, a good place to sojourn. It is located in the midst of many of the public bureaus and the charges are more reasonable than at many other hotels in Washington.

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The Royal Albert Hall of Arts and Sciences---A Magnificent System of Heating and Ventilation.

The subject of heating and ventilation is one of ever recurring interest, and of universal importance. We, therefore, copy from *Engineering* the following description of the apparatus employed in the immense Royal Albert Hall, in London, one of the largest public buildings in the world:

When it is considered that the Albert Hall of Arts and Sciences, now in course of erection at South Kensington, is to accommodate about 8,000 persons seated, the magnitude of the arrangements for preserving an equable temperature and a pure atmosphere will be realized. The capacity of the hall amounts to five million cubic feet, so that the warming and ventilation caused the committee some anxiety, and they invited a limited number of engineers to send in plans for effecting those objects. The various plans submitted were carefully considered, and it was finally resolved to adopt that of Mr. Wilson W. Phipson, Assoc. Inst. C. E., which is now being carried out under his immediate superintendence. The main points by which any arrangement had to be governed were economy in warming, and a satisfactory combination of this process with that of ventilation. The heating power determined on by Mr. Phipson consists of an arrangement of distinct coils of hot water pipes, placed in three air chambers. One of these chambers is carried under the main corridor, a second runs beneath the seats of the amphitheater stalls, whilst a third passes under the arena. These three chambers are connected with two fans, the combined supply of air from which will be about three million cubic feet per hour. One of these fans blows to the right and the other to the left, the fresh air drawn from the outer atmosphere being thus distributed through the chambers. This air, warmed by the hot water coils, is conveyed to the body of the hall from the chamber under the main corridor by means of channels built in the walls. These channels are also in communication with the corridors, boxes, and all the adjoining private rooms. From the chamber beneath the amphitheater stalls the warm air finds its way into the hall through perforations in the risers of the seats. From the arena chamber the air enters the building through the interstices between the floor boards. By these arrangements the entire power of the apparatus may be concentrated on the hall, thus thoroughly warming every portion of it; at the same time means are provided for warming the inclosed rooms independently when necessary. The amount of heating surface in the iron pipes required to carry out this arrangement is about 28,000 square feet. The temperature the apparatus is calculated to maintain in the hall is about 58° Fah. as a mean during the winter months.

The fresh air is supplied to the fans through two air shafts, 6 ft. by 6 ft., which are situated at the south-eastern end of the building, near the Horticultural Gardens. In each of these shafts is placed a self-acting valve, fitted with an index dial which registers the amount of air passing into the building. Arrangements are also provided in these shafts for cooling the air in its passage to the hall in summer by means of sprays of water. The fans are 5 ft. 9 in. in diameter, and are to be worked by two direct-acting engines of 3-horse power each. The heating apparatus fixed in the air chambers consists of sixteen distinct coils of 4-inch hot water pipes, heated by condensing boilers so arranged that each condenser has its direct coil of pipes to work. By this means either a part or the whole of the coils may be utilized, according to the temperature of the external air. These condensers are supplied with steam from two boilers belonging to the pumping engines of the Horticultural Gardens. In case of need a supplementary boiler will be provided, which will give a total force of about 75-horse power.

The *modus operandi* will be as follows: The temperature of the hall will be raised to the requisite degree by the time the audiences arrive; as soon as this point is reached, and whilst the public are being admitted, the air entrances to chambers, Nos. 2 and 3, will be partially closed by means of valves. This will allow of only one sixth of the amount of air necessary for ventilation to pass through these sources. The remaining five sixths will be distributed by means of four separate channels to the air chamber, No. 1, under the corridor. From this chamber the air will be distributed equally all through the entire building by means of the air channels formed in the walls, to which we have already alluded. It will thus issue upon every floor into the body of the hall, being admitted as far as possible from the audience.

The ventilation is provided for by an opening, having an area of 120 square feet, for the escape of the vitiated air, which is formed in the center of the ceiling at the highest possible level. This opening is surmounted by a shaft rising some feet above the roof and which is fitted with regulating louvres. The heat generated by the system of lighting the hall will increase the suction of this shaft at night. During day performances, however, continuous circulation will be insured by a ring of gas jets from burners with which the shaft is provided.

From a recent visit to the Albert Hall, we are enabled to report the satisfactory progress of the building generally, under the able superintendence of Colonel Scott, R. E. With regard to Mr. Phipson's arrangements, we found that the pipes for heating were all fixed in the outer circle main heating chamber, and the connexions were being made with the steam pipe to the condensers. About one third of the inner circle chamber is completed, and the remainder of the work is progressing. On Wednesday week the wedges between the crown of the roof of the hall and the scaffolding which had previously supported it were struck. The results of this operation were highly satisfactory, the total deflection being only five sixteenths of an inch. The roof, be it remembered, is of wrought iron, and covers an elliptical area of 220 feet by 185 feet, with a rise of 33 feet.

Music and Musical Instruments.

The first and most powerful instrument is the human voice. This has been acknowledged by the greatest artists, and all composition for single instruments owes its perfection to approximation to the human voice, and every instrumental artist must take a great vocalist for a model. "It is no wonder," says the well-known violinist Rode, addressing the Dresden orchestra, "that your tone is so fine; you are continually listening to great singers."

We might as well attempt to say how much has been thought as to answer the question, how much has been sung or composed for the voice? With the last singer the last man will have departed from the earth, as Anastasius Gruen so beautifully says. It would be impossible to name all the vocalists who have for ages past enchanted all grades of people; and, indeed, are not their names engraved upon the hearts and memories of the millions who had the happiness of listening to them?

Next to the voice the pianoforte claims our attention. This instrument, which, in its completeness, is the representative of the orchestra, and has arrived at a high state of perfection, is universally adopted by all civilized nations. From the middle of the last century some of the finest intellects have exercised themselves upon the perfection of this noble instrument, and we will mention only a few whose names are as familiar as household words. Streicher of Vienna, Erard of Paris, Broadwood of London, and last, but indeed first in this line of artists, Steinway of New York, whose remarkable inventions have transformed the pianoforte and brought the quality of its tone as near the human voice as possible.

The musical catalogues show yearly some three to four thousand new pieces adapted to the pianoforte, but the finest works for this instrument are the productions of the classic masters; still we cannot imagine anything more rounded in beauty, more flowing, more brilliant than a pianoforte performance carried out with all the modern perfection.

The amount of enjoyment, of refreshment, of enlivenment, of dissipation of care, of benefit the pianoforte has conferred on society, lies beyond the power of imagination to conceive or offer to describe.

Owing to the deficiency of the pianoforte in regard to the retention of tone, and the difficulty of access to the organ, a new instrument has been invented as a substitute, the Physharmonica or Harmonium, which has reached its greatest perfection in Paris.

The origin of stringed instruments goes as far back into antiquity as that of song. Apollo represents both these forms of spiritual manifestation which have their impulse deep within the human heart.

In their various degrees of hight and depth of tone, the violin, the viola, the violoncello, and the double bass, correspond with the various gradations of the human voice—the soprano, alto, tenor, and bass. The violin is the queen of the orchestra and the most esteemed solo instrument in concerts. With a wider range, and less circumscribed in its effects, it is a very appropriate representative of the soprano voice. Its highest aim, therefore, is to compete with song. The violin advanced to its standard of perfection under the hands of the Italians; but the efforts of the French school must also be acknowledged, upon which Spohr improved, transplanting it to German soil.

It is strange that upon this little capriciously-shaped instrument, which will not suffer itself to be modified in the slightest degree, such mighty performances should take place. The well-known Cremona violins made by Stradivari and by Peter and Joseph Guarneri, and Amati, now about two hundred years old, surpass all others, notwithstanding the beauty of finish and structure of those made by Stainer and Villaume.

The violin, in accomplished hands, is undoubtedly the instrument that reveals the fullest emotion; it can be made to touch the chords of the human heart as effectually as the wind does those of the Æolian harp.

Of the most prominent performers on this instrument we mention but a few, such as Rode, Spohr, Viotti, Kreutzer, Baillol, Paganini, De Beriot, Ernst, Vieuxtemps, Molique, Sivori, Ole Bull, Lipinski, Lvoff, Mlilanollo, and in quite recent times, Joachim.

The treatment of the viola and violoncello is similar to that of the violin; but both instruments have their special character and their respective worshipers who give them the preference over the violin.

The viola approaches nearest to the human voice in the quality of its tone, and the great masters have therefore employed it very frequently, although it is but seldom used for solo performances. It occupies a particularly conspicuous position in Weber's and Spontini's operas.

The violoncello is more generally adopted as a solo instrument, and proved a thing of rare beauty under the hands of such performers of the past and present as the following: Romberg, Dotzauer, Servais, Merk, Kummer, etc.

The double bass is the foundation of the whole bass power of the orchestra, and has in recent times received much cultivation, owing principally to Beethoven, who uses it very extensively in his symphonies. It is but seldom used as a solo instrument, although in former days Hindl of Vienna, and, more recently, Bottesini have delighted audiences by their performances.

In passing to the wind instruments we all know the peculiarly soft and clear tones of the flute; the hautboy with the tones of pain and humor; the clarionet with its impassioned notes; the bassoon with its bass voice of pain or good-natured bluster; the horn with its magical tone, full of forest associations; the trumpet with its martial and alarming sounds; and the majestic, profound, and serious trombone.

The significance of the various instruments is best learned by their application. The best study for this purpose is the symphonies of Beethoven and the operas of Weber, wherein the listener discovers the most acute appreciation of the capacities and the finest perception of the use of the different instruments.

In earlier times instrumentation was much more simple than it is at present, and abuses have crept in, the great excess often thwarting its own ends, although great effects have been produced by men like Spontini, Berlioz, and Meyerbeer. The latter has appropriated instruments that occur but seldom in the orchestra, which has frequently resulted in great effects.

The guitar has received considerable cultivation from Guiliani and Stoll; and so has the harp, in more recent times, especially through Parish Alvars, a man of great and surpassing talent.

The impression made by all music depends to a certain extent upon the peculiarities possessed by the instruments enumerated, but still more essentially upon the scale or mode, of which, it is well known, there are two, the major and the minor; the former distinguished for its expresion of cheerfulness, the latter more indicative of melancholy. In these two modes the various gradations of musical thought are depicted, although other conditions assist in varying musical expression, which is far more diversified than that of words.

To overlook the united influences of music upon the life of the people must be impossible, because the part of life so influenced is the best part; it is the inner life—the life of the soul and the mind. To almost every one music brings refreshment and elevation, and often inspiration, and is, at the same time, a relief from the labors of the day. This applies to all classes of society, and beginning with the unpretending dance ascends thence to the higher enjoyment of the opera, or of the symphony. From these higher creations of the art the more susceptible and cultivated people have derived their most complete enjoyment; and it is incalculable how many have received new energy, new thoughts and refreshment, after the toils of the day, comfort in dark hours, and fresh inward life; how many, forsaking the disjointed order and the disturbed harmony of the world, have sought and found a more perfect order, a more complete harmony, in that picture of a more lovely world—the world of tone!—*Stewart's Quarterly.*

Manufacture of Alum.

The alum works of Harrison Brothers' chemical establishment, Philadelphia, Pa., are very extensive. At one end are sheds in which is stored the aluminous earth or clay, procured mostly from New Jersey. It is dried, and then ground and calcined in reverberatory furnaces. When thoroughly calcined and purified, it is, while hot, digested for some hours in immense vats of dilute sulphuric acid. It is then washed with water, and concentrated—sulphate of ammonia having been previously introduced. It is again washed and freed from any remaining impurities, being thus double refined, and then boiled by steam in a Roching kettle to a high degree of concentration; it is finally transferred to the crystallizing tubs. These are about eight feet high, and made of strong staves, which are so put together in sections as to be easily separated. At the end of eight or ten days, the sections being removed, a cylindrical mass of apparently solid alum is revealed. This being pierced near the bottom, the mother-water at the center flows off along the sloping floor into leaden subterranean cisterns, whence it is subsequently pumped and variously utilized. The "Pillars of Salt," or, rather, of ammonia alum, as the product is called in commerce (the article may be more accurately termed a double sulphate of alumina and ammonia), when pierced and cleft, are suffered to stand till the mother-liquor has wholly dried off, and are then broken up and barreled for the market. Each tub produces about twenty-one barrels. This article is largely used by calico printers in the preparation of the mordant for their dyes, by paper and color makers, by tanners, and in medicine.

A very ingenious and important use of alum is for safe fillings. Dry plaster is an excellent non-conductor of heat. Alum, which is broken up and mixed with the plaster in these safes, contains a very large percentage of water of crystallization, which is liberated at a temperature somewhat above 212°, and affords thus the most efficient protection to the contents of a safe that has ever been devised. About 25 to 30 barrels of alum per week are used by Marvin & Co. in the manufacture of their safes.

Birds vs. June Bugs.

Lest the readers of the SCIENTIFIC AMERICAN should think that we misstated the ignorance that prevails, even in this country, regarding birds and insects, let them read the following:

For some days past there has been a man (civilized?) engaged in the neighborhood of the writer's residence shooting robins, ducks, and fowls because they eat his potatoes! His lot, which has only potatoes and apple-trees on it, was turned up from grass this spring; the June bugs, the grubs of which are similar in habit to those of the cockchafer, have been unusually abundant, and the robins have resorted to the turned up ground to feed upon the grubs and beetles, the former of which would probably destroy the young shoots of the potato, the latter, the leaves of the apple-trees. Yet this senseless being shoots the robin. We almost wish to anathematize such foolish ignorance with Athanasian-like energy. But as all anathemas will only, if fulfilled, spread scourges upon ourselves—may some one who knows the laws on the subject prosecute the wretch, and may an honest judge be found to reach the only seat of what glimmering of reason he has—his purse.

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[For the Scientific American.]

THE SCORPION.

[By Edward C. H. Day, of the School of Mines, Columbia College.]

Every one has heard or read of the scorpion; there are no natural objects more familiar to us than insects; and yet, we venture to say, that there are but few readers of the SCIENTIFIC AMERICAN, excepting those who have been educated in the technicalities of natural history, that can place the scorpion in its proper position in the animal kingdom, or that can give anything like an accurate definition of the word insect.

The great sub kingdom or "branch," as some naturalists term it, of the animal kingdom, called the articulates, consists of those animals in which the entire being is divided into a series of joints, inclosed in rings forming, generally speaking, a hard external skeleton. In the lower forms, frequently, each segment possesses a more or less perfect individuality, and the total number of segments may be very great. Thus in the tapeworm they may be counted by hundreds, and most of the joints are capable of a temporary independent existence.

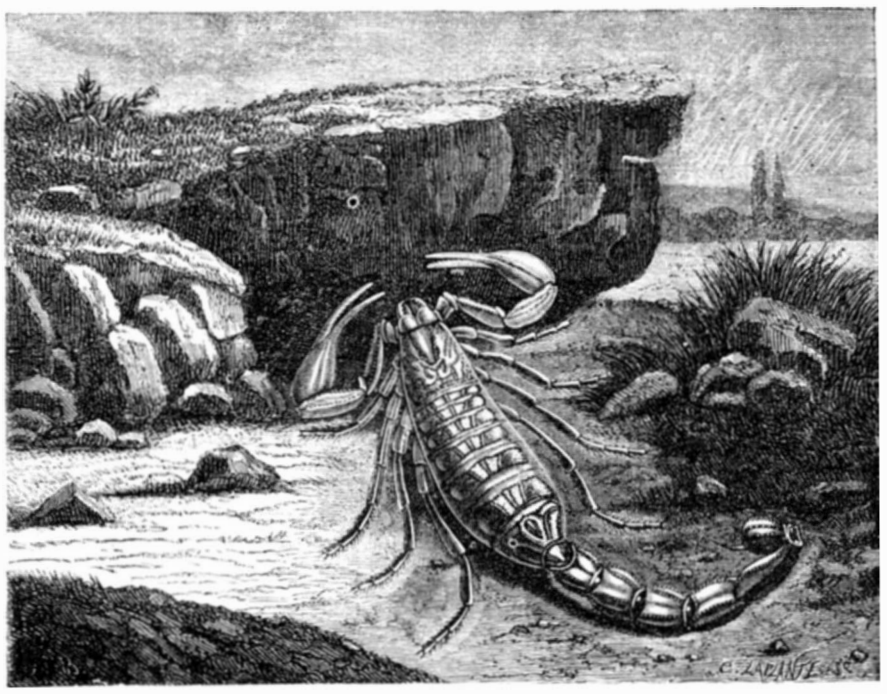
On the other hand, in the spider, the division into segments, although existing, is almost concealed, the animal being apparently divided into but two regions—the one composing the head and the limb-supporting portion of the body, the other constituting the hind-body or abdomen.

Among the creatures included in the articulate sub-kingdom, we thus recognize a primary broad distinction between those in which the ringed character is most apparent, and locomotive organs are altogether wanting, as in the common earthworm; and others, such as the lobster, the spider, and the various winged insects in which the repetition of joints is not necessarily so prominent a feature, and which are all furnished with distinct limbs. To the former group the great Linnæus gave the appropriate name of *Annelida*; the various members of the latter he massed together as *Insecta*. Later observers found, however, that the crustacea of which the lobster is the type, presented such great differences from the rest that these were separated as a class equal to the annelids. Thus the winged insects, the spiders, and the centipedes, were left together as the class of insects—and this classification obtains with many scientific men at the present; others, however, restrict the term insects to those articulates which, in the perfect state, have but six legs and are mostly winged, and class the spiders, scorpions, and mites, which have eight legs, as "arachnids," and the centipedes and galley worms, which have an indefinite number of feet, as "myriapods."

Thus the word insect is used at the present day by scientific men in two senses, and following the maxim that when doctors disagree opinions are free, the reader may consider himself at liberty to use the term indiscriminately. But if he is wise and wishes to avoid confusion and to cultivate accuracy of speech, he will recognize the importance of confining himself to using it in one or the other sense, and in that alone. Popular usage is, from ignorance, so loose on this point as on many others, that it indicates no choice; we would, therefore, recommend that the term "insect" be restricted to the first group, and that the words "arachnid" and "myriapod" be introduced into every-day language to indicate the others. There will be no difficulty in "naturalizing" such words as conversational terms, if taught to children with examples, just as they learn the words bird or fish. Let bees, butterflies, beetles, and bugs, be always spoken of as insects; a spider as an arachnid; a centipede as a myriapod. The two latter words are not harder to learn or less significant, while they will be far more frequently called into use than such words as hippopotamus or rhinoceros, about which many-syllabled compounds of Greek derivation neither old nor young ever make any great difficulty.

According to this system the scorpion is an arachnid, a member of the same group as the spider. The reader perhaps may fail to see much resemblance, and thinking of a lobster may ask: "Here are four pairs of legs and a pair of pinching 'claws,' and a long jointed hind-body, why don't you place this animal with the lobster among the crustacea instead of with the spiders, which have no such large pincers and a rounded unjointed abdomen?" These resemblances are only apparent; the differences are essential. The claws of the lobster are modified legs, those of the scorpion are greatly developed mouth organs—the latter belong to the head, the former to the creature's body. Again, if you examine the so-called tails, each segment of that of the lobster is provided underneath with a pair of little fins, while those of the scorpion are as free from such appendages as the abdomen of the spider. The respiration of the crustacean is by gills within its body—it breathes air from the water in which it lives, drawing in the water through its mouth, or even in some cases through its shell; whereas the scorpion breathes air directly by means of openings in its sides leading into (loosely speaking) lung-like sacs. Finally the lobster arrives at its adult state only after passing through a series of wonderful transformations, while the scorpion is viviparous, or rather ovo-viviparous—the eggs being fully developed and hatched within the body of the parent, and the young scorpion thus born begins life in its adult form, altering but little afterwards save in size. In this fact the reader will notice that there is a very essential difference from the development of the six-footed insects as described in a former paper. The difference between the spider and the scorpion is similar in its nature to that between the crab and the lobster. As the long, powerful, tail-like abdomen of the latter is represented by the almost unseen one of the former tucked away under the real body, so the rounded abdomen of the spider represents the long-jointed tail of the scorpion with all the parts concentrated and brought nearer the central governing head.

The spider, therefore, stands higher in the scale of existence than the scorpion—the formidable-looking though really harmless claws of the latter are represented by certain mouth organs called "palpi" in the spider. Instead of the sting at the end of the tail that gives the former its evil fame, the latter has hollow jaws, associated with venom glands, in its mouth. The scorpion's sting consists of a hollow claw, underneath which is the poison gland, and when the creature



THE RED SCORPION.

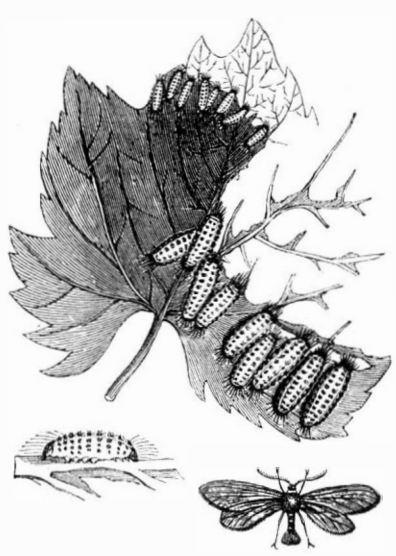
strikes its foe or its prey, the venom is injected into the puncture. The effects of this venom have been much exaggerated. In some cases of enfeebled or peculiarly susceptible constitution a bite may prove fatal, though such is seldom the case, the wound, however, generally producing very disagreeable effects. The most curious fact is, that the poison acts strongly on the creatures themselves. It is said that if several be confined together they will soon be all killed excepting perhaps a solitary survivor. So well was this susceptibility to its own poison recognized formerly, that the story was originated that when a scorpion becomes tired of life it commits suicide. Thus stated we fully assent to the statement, the little conditioned word "when" being, according to our idea, a sufficient guarantee against a very frequent occurrence of such scorpionic hari-kari.

[At least this is the opinion of M. E. Blanchard, as expressed in his beautiful work on insects and their metamorphoses, but Rev. Dr. Smith, President of Dartmouth College, who spent the past winter at the Island of Jamaica, informed us he had ocular proof that, under peculiar circumstances, the scorpion stung itself to death.—EDS.

Insects Injurious to Grape-Vines.

[From the Second Missouri Entomological Report].

During the months of July and August, the leaves of the grape-vine may often be found denuded of their softer parts,



with nothing but the veins, and sometimes only a few of the larger ribs left skeleton-like, to tell of the mischief that has been done. Very frequently, only portions of the leaf will be thus denuded, and in that event, if we examine such a leaf closely, we shall find the authors of the mischief drawn up in line upon the yet leafy tissue, with their heads all toward the margin, cutting away with their little jaws and retreating as they feed.

These little soldier-like files are formed by worms in black and yellow uniforms which produce a moth popularly known as the American Procris. The eggs from which they hatch are laid in small clusters on the underside of the leaves, and while the worms are small, they leave untouched the most delicate veins of the leaf, which then presents a fine network appearance, as shown at the left in the cut; but when they become older and stronger they devour all but the larger ribs as at the right of the figure.

When full grown these worms disperse over the vines or forsake them entirely, and each spins for itself a small, tough, whitish, flattened cocoon, within which, in about three days, it changes to a chrysalis 0·30 inch long, broad, flattened, and of a light shiny yellowish-brown color. In about ten days afterward the moths (shown in the figure) begin to issue. This little moth is the American representative of the European *Procris vitis;* it is wholly of a black color, except the collar, which is of a deep orange, and the body ends in a broad, fan-like, notched tuft, especially in the male. The wings are of a delicate texture, reminding one of crape, and when the insect is at rest they generally form a perfect cross with the body, the hind wings being completely hidden by the front ones, which are stretched out straight at right angles, as in the genus *Pterophorus*, to which belongs the Grape-vine Plume.

The full grown larva measures rather more than half an inch, and tapers a little towards each end. It is of a sulphur yellow color, with a transverse row of six velvety-black, prickly tufts on each of the principal segments, the lower tufts being less distinct than those on the back. The first segment is entirely black with a yellow edge, while the spots on segments 11 and 12 usually run into one another. Head small, brown, and retractile, being usually hidden in the first segment. Fine scattering hairs anteriorly, laterally, and posteriorly. The young worm is of a very pale yellow, covered with numerous fine white hairs, with a slight grayish-brown tint on the head, and with the fifth and seventh segments paler than the rest, and having the black spots scarcely visible.

This is the only North American grape-vine feeding caterpillar which has a gregarious habit, and as gregarious insects are always more easily subdued than those of a solitary nature, the American Procris need never become very destructive. Its natural food is undoubtedly the wild grape-vines of our forests, and the Virginia Creeper, and Mr. J. M. Jordan of St. Louis, has noticed that while it very commonly attacks the foliage of the Concord, yet it never touches the Clinton and Taylor in his vineyard—a taste which is remarkable and not easily accounted for, since the foliage of the latter kinds is more tender and generally more subject to insect depredations than that of the former.

There are two broods of this insect each year with us, some of the moths from the second brood of worms issuing in the fall, but the greater part not leaving their cocoons till the following summer.

Perpetual Motion.

We have received from John C. Gardner a copy of his neatly printed pamphlet of 52 pages, entitled "Perpetual Motion," of which he is an earnest advocate. He employs a variety of mathematical demonstrations in support of the doctrine, but gives us no clew to the particular form of machine which is to be a practical illustration of his theories. He however affirms that aerial navigation is a natural consequence of his discovery of perpetual motion, and we therefore expect before long to see him flying about from point to point, and showing his feathers. His concluding deductions that his perpetual motion theories must be correct because nobody has disproved them, remind us very forcibly of Mark Twain at the grave of Adam.

"It is a singular circumstance," says Mark, "that right under the roof of this same great church, and not far away from that illustrious column, Adam himself, the father of the human race, lies buried. There is no question that he is actually buried in the grave which is pointed out as his—there can be none—because it has never yet been proven that that grave is not the grave in which he is buried. I leaned upon a pillar and burst into tears. I deem it no shame to have wept over the grave of my poor dead relative."

Arsenic in the Soda of Commerce.

Dr. Fresenius calls attention to a fact, accidentally discovered by him, that the carbonate of soda (neutral), as met with in a crystallized state, and as manufactured at the alkali works, now often contains a very perceptible quantity of arseniate, or arsenite of soda, undoubtedly due to the use of sulphuric acid for converting the common salt into sulphate of soda, which acid contains arsenic, derived from the pyrites of which few are quite free from arsenic, and some of which contain that substance in considerable quantity. The tests applied for the detection of this arsenic were not the most delicate in use for this purpose; and the quantity found, though small, is sufficient to affect the purity of preparations for medicinal and chemical use.

PROF. CHANDLER, of the School Mines, Columbia College, recently gave a very delightful afternoon reception at his residence in 49th street to Dr. Vogel, of Prussia, who is now on a visit to this country as a delegate to the convention of photographers at Cleveland. President Barnard, of the College, Dr. Doremus, Prof. Silliman, and other distinguished gentlemen were present.

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Improved Steam Excavator.

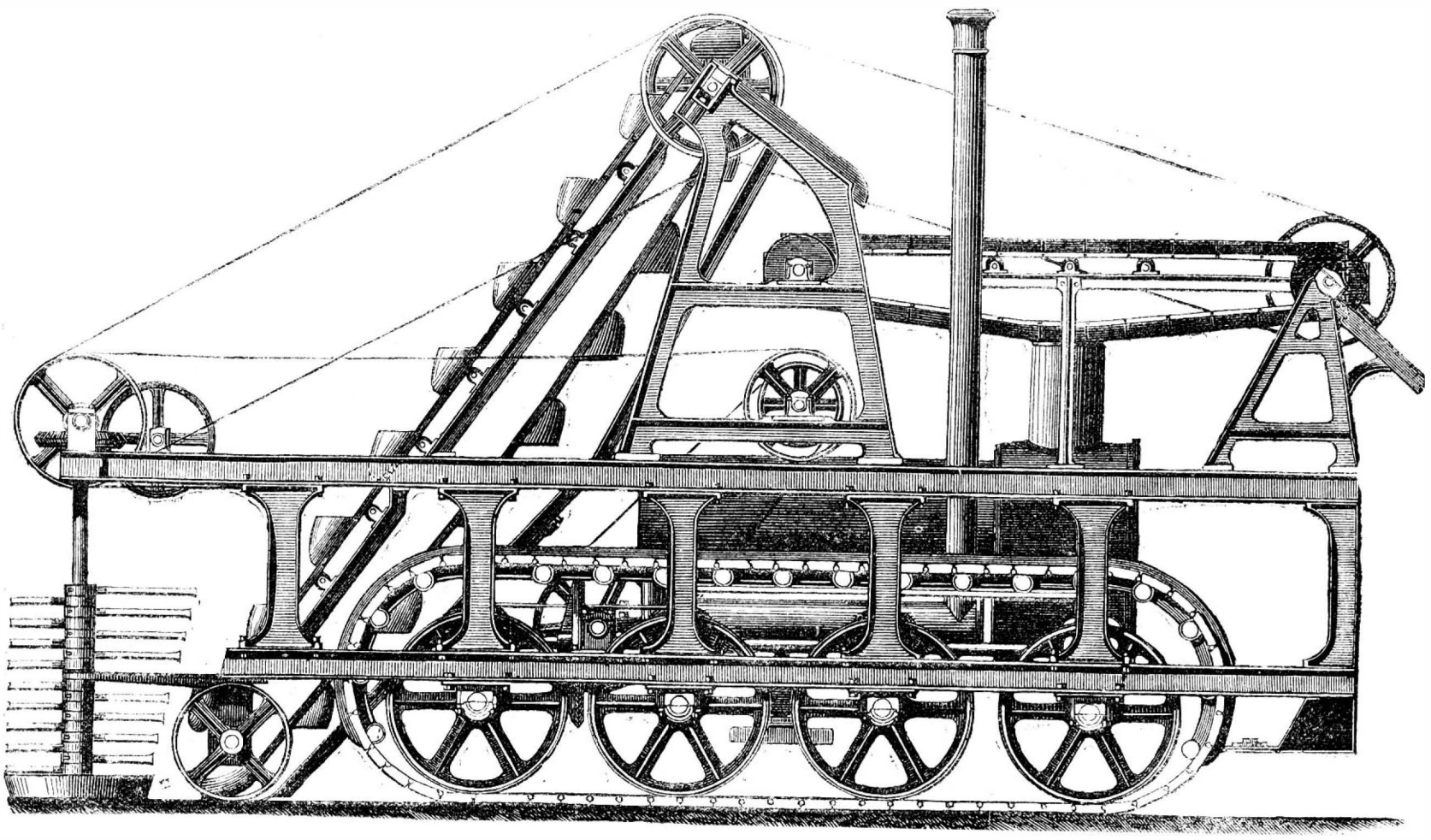
[From The Engineer, London.]

If the question were asked, is it possible to supersede every description of manual labor by the substitution of machinery, the correct answer would be to the effect that there is no doubt about the absolute possibility, but very considerable doubts regarding the expediency of the measure. No people have pushed this principle so far as the Americans—not so much from choice as from sheer necessity—and yet they find that there are some operations which must either continue to be performed by hand, as of old, or not performed at all. The price of labor is one of the most important circumstances bearing upon this subject, although it is equally affected by other considerations. One thing is certain, that, but for the higher cost or the absence of labor, a great number of present admirable inventions and plans in practice for employing machine *vice* hand labor would never have seen the day. It is not difficult to conceive the application of machinery to purposes of manufacture, and there is a certain amount of fitness in so employing it. But it requires a great stretch of the imaginative faculties to consider it as applied to land. Yet for large tracts of country it is now universally recognized as the only proper agent. Steam plows and steel cultivators are, after a hard fight, overcoming the prejudices and almost hatred entertained towards them by the agricultural population. Farming implements on a less pretentious scale, which have for their object the reduction of the laborers' toil, are now to be seen in and about the premises attached to every farm laying any claim to the epithet "large," and even small ones are provided with pulpers, bruisers, grinders, and other small machines, to an extent our grandfathers little imagined.

Engineers are continually being put in mind of the fact that the surface of the earth and its physical features require a good deal of alteration and modification before they can be rendered subservient to the wants and requirements of this age of progress. Excavating and embanking, or, in other words, the transport of some portion of the earth's surface to some other spot than where nature has placed it, is a perpetually recurring operation in all works of engineering and construction generally. The making up of embankments is simply a work of time; it is in the excavation that the navvy has to put forth his bone and muscle; it is by digging that the necessary material for the bank is obtained. We have the highest authority for knowing that in early times digging was, as it is now, the last resource for men who had no other means of gaining a livelihood but by manual labor; it cannot, therefore, be regarded as a very gentlemanly pursuit. Whether M. J. Vandenvinne has been actuated by these considerations we do not know, but he has recently invented and patented a machine for excavating earth which promises to be of great value and practical utility. The accompanying illustration represents it in elevation, and a brief description will render perfectly clear the manner in which it operates. In the first place there is no engine required. A glance at the cut will indicate that it is a steam engine as well as an excavating machine, and combines the motive power and the excavating agent all in one. The whole principle of the apparatus may be explained briefly by stating that the earth is excavated by a double series of horizontal picks rotating in opposite directions, which literally claw away the earth in front of them as the machine advances. It consists of a strong cast-iron frame-work, to the back of which is attached a steam engine for giving a forward or backward motion to the machine, and for driving its working parts. A pulley is keyed on the shaft of the steam engine which drives another pulley fixed on a horizontal shaft placed in the front of the machine; this shaft carries at each end a bevel pinion, which gears into two bevel wheels fixed on two vertical wrought-iron shafts, around each of which are fixed a certain number of picks or mattocks. These picks are arranged screw-wise, forming about a quarter of a revolution, and turning in opposite directions in such a manner that the picks of one of the shafts fit into the corresponding spaces left between the picks of the other shaft. These picks are in the form of a shovel, and as they dig out the earth horizontally it is thrown back and falls into buckets placed to receive it. Curved sheets of iron are arranged so as to prevent the loose earth from falling at the sides, and impeding the advance of the machine. The buckets are fixed on an endless chain passing over two drums, one at the bottom and the other at the top of the machine; the shaft of the top drum is driven by a band passing over a pulley fixed on the horizontal shaft before mentioned. The buckets are thus in incessant motion, and carry up the earth to the top of the machine, and turn it over on an endless chain which passes over two drums, on the shaft of one of which is fixed a pulley driven by a band from a pulley on the drum shaft of the trough chain. This endless chain carries the earth to the back of the machine, whence it may be carted away.

When required the apparatus can be so arranged as to deliver the earth at the side instead of at the back. Friction rollers are placed in suitable supports under the endless chain of the dredge, and also under the endless chain carrying the earth to the back of the machine. At each side of the latter chain, sheets of iron are fixed to prevent the earth from falling off, and two iron sheets, moved by a screw, are placed under the troughs on their descending side to prevent any earth falling into the machine. The forward movement of the machine is effected by means of a pulley fixed on the shaft of the steam engine, which drives a pulley fixed on a shaft in the lower part of the framework. The latter shaft drives by means of a wheel and pinion another shaft furnished with a bevel pinion gearing into and driving a bevel wheel fixed on a shaft carrying three endless screws. By these means motion is given to three gearing wheels fixed on the axles of the six wheels or cylinders on which the machine moves upon the endless floor. The machine has besides two other wheels placed towards the front part. A screw jack is adapted to the machine to raise it up when required to make it pivot on itself.

The necessity for enabling a machine of this description to work to any required gradient has been foreseen and provided for, as well as the case of curves, which, in the present day of railway making, approximate closely to what might be termed turning corners. In the engraving is represented a small machine weighing rather more than four tuns, and only about three-horse power. We witnessed its performance at the Ashburnham grounds at Chelsea some time ago, when it excavated the ground to a depth of 2½ feet. It broke the earth up small, and threw it into the buckets or hoppers, by which it was conveyed to the rear. One of the large-sized machines, weighing twelve tuns, is at work in Belgium, where it is performing in a most satisfactory manner. The speed of the advance can be regulated by the engine at pleasure. From the exceeding neat, clean cut made by this machine it appears to be admirably adapted for the cutting of trenches, for laying gas, water, and other pipes and drains, as there need never be any more earth excavated than what is actually required.



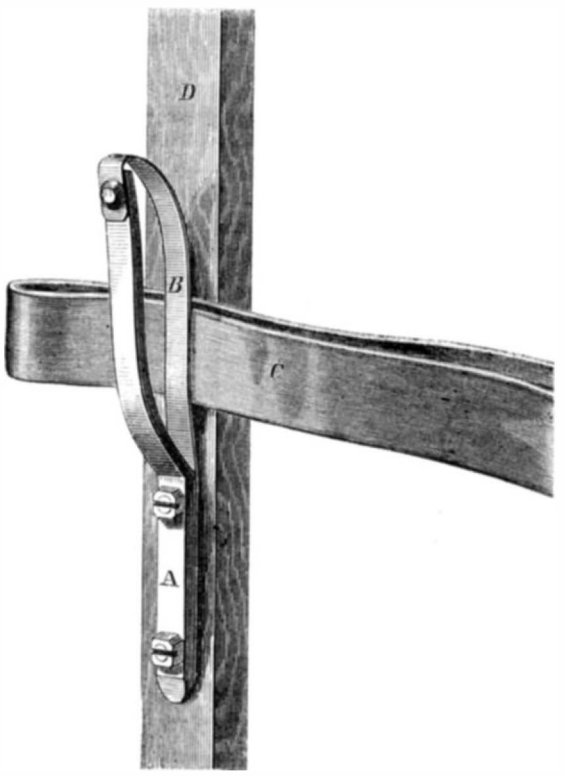
VANDENVINNE'S PATENT STEAM EXCAVATOR.

The Largest Pump Manufactory in the World.

The catalogue of Rumsey & Co., Seneca Falls, N.Y., embraces over 200 different styles and sizes of lift and force pumps. They are now turning out 1500 pumps per week, which range in price from $3 to $400, employing 130 hands in the business. John A. Rumsey has recently patented an improved galvanized non-corrosive cast iron pump which is safe from rust. An improved Hand Fire Engine, of great efficiency, is also on their list. The machinery in Rumsey & Co's factory is of the most efficient kind—much of it being of their own invention, and is driven by an unfailing water power. They are now building a new factory, 84 by 42 feet and 4 stories. When this is completed they will increase their working force to 250 hands. The business now carried on by this firm was established by Rumsey about 30 years ago.—*Boston Commercial Bulletin.*

ACHENBACH'S REIN HOLDER.

The fastening of the reins is one of the annoyances of horsemen. It is by no means conducive to good nature to return after leaving a horse hitched for a short space, to find the reins which you had endeavored to tie up securely, down under the horses' feet, foul with mud and filth. Yet in the usual way of fastening, unless special pains are taken, and the flies are less than usually annoying, such unpleasant consequences are almost sure to result. Besides, the knotting of the reins crumples and wrinkles them greatly, injuring their appearance.



Our engraving illustrates a neat little device, which completely removes all the disadvantages we have named.

A is a metallic bracket bolted to the bow, D, of the carriage top, dashboard, or other convenient part of the carriage. From the inside of this bracket rises a spring, B, the upper end of which is turned over and riveted to the upper end of

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the bracket so that it cannot catch upon the clothing or injure the hand. When it is desired to secure the reins, C, all that is necessary is to press them down behind the spring, B, as shown in the engraving. It is done in an instant, and the fastening is perfectly secure as the spring holds with great force. The attachment may be made ornamental in appearance.

Patented, through the Scientific American Patent Agency, June 7th, 1870. Address, for further information, John R. Achenbach, Saddle River, N. J.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Immortality of the Soul.

MESSRS. EDITORS:—Upon page 353, current volume, SCIENTIFIC AMERICAN, there appeared an article under the following caption, "A Clever Hoax—Who is Dr. Ivan Slavonski?" Let the doctor be whomsoever he may, there is one thing certain, and that is, the viciousness of his atomic theory of the universe. It is not only vicious, but unthinkable. We cannot imagine an atom so small as to be without an upper and an under side, a right and a left, hence it is impossible for us to conceive an indivisible atom. But I digress. I wish to call your attention to "The Hydropollusis." From the tenor of your remarks, I judged that your faith in that prophecy was somewhat diluted. Now, do you mean to assert that it is only a postulate—a mere figment of the "fine metaphysical mind?" Do you deny that there is a constant and uniform change in the inclination of the earth's axis? If you do not, then there is no alternative—you must indorse the prediction. True, the prediction extends to a very remote, but not an inconceivable future. Geologists have discovered traces of a "Glacial Period," and have revealed the cause; then why may we not predict the effect? Unless I am very much mistaken, there will be an astromical calculation made public ere long, that will dwarf the above prediction into infinitesimal proportions. I allude to the measurement of the solar orbit. Just think of it, that will be a prophecy all but transcending human comprehension.

Allow me to refer to a prediction made by the poet Longfellow:

> A traveler, by the faithful hound,
> Half-buried in the snow was found,
> Still grasping in his hand of ice
> That banner with the strange device
> Excelsior!

The traveler is the State of New York, or at least that portion of the State which shall be most elevated six thousand years hence. The faithful hound will be some future Arctic explorer, and that banner with the strange device, nothing less than the ruins of our superior civilization. Don't you believe it? Then you needn't that's all. P. L. B.

New York City.

[We do not disbelieve in the change in the inclination of the poles of the earth, as our correspondent seems to think. But we more than believe that the theory of life ascribed to Dr. Meissner, a mythical German professor, the Hydropollusis, and the mathematical demonstration of the immortality of the soul, by the celebrated Dr. Slavonski, were written as clever hoaxes, with a basis of truth at the bottom sufficient to give them an air of reality, and that they went as far and duped as many people as the celebrated Locke moon hoax, which many of our readers will remember. This is what we know. We have little doubt some future generation will get a wetting from the change in the inclination of the earth's orbit referred to, but that the catastrophe will be as extensive as the author of hydropollusis sets forth we have some doubts. [EDS.

The Universe--Comets--Meteorites.

MESSRS. EDITORS:—Men of science everywhere are busy at work upon the great problems of nature—microscopic and telescopic—material and mental. The following brief suggestions may be useful to those who are engaged in these recondite researches.

The *Universe* has been well enough defined, "*that whose center is everywhere and whose circumference is nowhere.*" Yet, it is plain that the thing thus defined is an inexplicable mystery; but there can be no doubt of its existence.

The present is eternity; and hence any time, so to speak, (for time is a fiction) in the past has been, and any future period will be precisely in the midst of eternity.

The universe never had a beginning; and, being unlimited in extent, of course it never can cease to exist.

There are as many material organisms in process of formation in the universe to-day as were ever formed during a similar era in the past, or that ever will originate in a like period in the future. And, on the other hand, there are as many organic bodies being destroyed in the universe to-day as at any equal period in the past, or that ever will be destroyed on any day in the future. Organic productions, destructions, and reproductions of every kind throughout the universe follow each other in rapid and unending succession.

The numberless material organisms which constitute the universe—past, present, and future—began, and of necessity must originate in rudiment. This is likewise true of the mind, of the arts and sciences, and of all human knowledge. *Everything begins in rudiment.*

By means of the foregoing wide generalizations, most of the phenomena of the visible universe may be rationally explained. The earth, for example, had neither an aqueous nor igneous origin, but it is probable that it sprung spontaneously from favorable chaotic molecular conditions—the peculiar nature of which is inscrutable to the human intellect—the cohesion of its elemental materials being effected by the action of that innate function of matter, called gravity, and thus simultaneously developing the threefold constituents of all organized bodies, namely—*matter, principle,* and *motion.* For a long period the inchoate organism gradually developed by molecular accretions, which, being powerfully compacted together in the sphere form and thereby producing heat, at a comparatively early period of its existence, the matter constituting the nucleus or center of the body spontanously fused; and as the asteroid increased in size, the internal fusion progressed *pari passu,* with only a superficial crust of cold materials upon the surface at any time. In this manner the rudimental earth at length attained maturity, or what may be more properly called its second stage of existence, and in which it became prolific of life—vegetable and animal. The third stage of our planet will be that of its spontaneous combustion, which will transform it into a *sun-star,* and thenceforward it will constitute, either alone or in combination with others, one of the self-luminous bodies in space which do perpetually, but only partially, illuminate the universe. And, finally, after the materials constituting the flaming orb have been greatly reduced by this destructive process, and its illuminating power correspondingly diminished, it will gradually decline till it reaches the fourth and last stage of its existence—that of a comet. In this latter condition, like that of an old man worn and wasted by the weight of long accumulated years till he reaches a sort of second childhood, the star will wander away from its old stellar home, distributing its residuary matter far and wide through the limitless field of *black chaotic space,* and at last disappear in a gaseous mist!

Hence, it is more than probable that there are now, ever have been, and always will be innumerable rudimental heavenly bodies in the universe. Meteorites, I imagine, are but the fragments of such inchoate organisms, casually broken in pieces by collisions with each other, and scattered through the unending planetary systems revolving in boundless space. Like feeble and tottering infants which are not subject to the laws that govern adults, the children of the universe are not so rigidly controlled by gravity as the older systematized heavenly bodies; and consequently in their erratic motions they sometimes pass between our earth and the sun, and thus produce those dark spots which occasionally appear on the face of the latter body.

The foregoing views, when fully elucidated, will serve to resolve the problems of the universe—as far as they may be comprehended by the mind of man. R. O. D.

Subjects for Investigation.

MESSRS. EDITORS:—We frequently see in scientific works that light and heat are spoken of as "things" *per se,* or, in other words, as entities of themselves.

To one who has for over thirty years held the opinion that light and heat are only *conditions* of matter, the question, Where does all the heat go? is just as foolish as to ask "Where does the motion go when a train of car stops?"

When we move our arms, we have motion. When we cease to move it, the motion is non-existent. When we ignite a candle, we have light and heat; blow it out, *both cease to exist.* We have no knowledge of either apart from matter in a state of combustion or friction, and to treat of them otherwise seems unphilosophical.

We hear and see a good deal about the "Law of Gravitation." Is there such a law? Gravitation is supposed to be a property of matter, and to emanate from it, like an odor or heat, inversely as the square of the distance. What proof can be afforded that such is the fact?

"About the year 1805 it occurred to Sir Richard Phillips that, as the fall of bodies is a mere phenomenon of motion on a moving globe, itself subject to two great motions; so, any variance in the direction of these, would, as in all such cases, produce an *increase* of velocity in a body surrendered to their free action; and the direction to the center would be likely to be the constant diagonal of both."—[See "Million of Facts."]

If you desire it, Sir Richard's proof can be given; of which he says, "No other proof resembles this, in the whole circle of natural philosophy." There are other subjects that more immediately concern us, which might be investigated with profit. For example, several thousands of laborers are without employment in San Francisco, Cal. It is said that "labor is the only legitimate source of wealth." If so, why is it that these people are unemployed? Is wealth so abundant that their labor is not required? Certainly not, for we learn that many of them are in poverty. What then is the cause of this stoppage of production? A. R.

Washington, Texas.

Lancaster Beer.

MESSRS. EDITORS:—I send you the result of an analysis of the celebrated Lancaster beer of Pennsylvania, that I have recently made. It is as follows:

	Parts.
Alcohol	3·8000
Dextrine and gums	4·3060
Sugar { cane, ·4698 / grape, ·7840 } Total	1·2538
Free acetic acid	·0316
Albumious matter	·0238
Lupuline (bitter principle of hops)	·6222
Ash (chiefly phosphates and sulphates)	·5992
Total	10·6366
Water	89·3634
	100·0000

I believe this is the first analysis ever made of this beer. I think it may prove interesting to some of your many readers.

I have been very much interested in the Notes on Science. in your valuable paper. F. G. DU PONT.

Wilmington, Del.

Professor Henry of the Smithsonian Institute on Lightning Rods.

In answer to a letter of inquiry as to the best method of erecting and constructing lightning rods, Professor Henry gives the following instructions:

1. The rod should consist of round iron of about one inch in diameter; its parts, throughout the *whole* length, should be in perfect metallic continuity, by being secured together by coupling ferrules.

2. To secure it from rust the rod should be coated with black paint, itself a good conductor.

3. It should terminate in a single platinum point.

4. The shorter and more direct the course of the rod to the earth the better; bendings should be rounded, and not formed in acute angles.

5. It should be fastened to the building by iron eyes, and may be insulated from these by cylinders of glass (I don't, however, consider the latter of much importance).

6. The rod should be connected with the earth in the most perfect manner possible, and nothing is better for this purpose than to place it in metallic contact with the gas-pipes, or, better, the water-pipes of the city. This connection may be made by a ribbon of copper or iron soldered to the end of the rod at one of its extremities, and wrapped around the pipe at the other. If a connection of this kind is impracticable, the rod should be continued horizontally to the nearest well, and then turned vertically downward until the end enters the water as deep as its lowest level. The horizontal part of the rod may be buried in a stratum of pounded charcoal and ashes. The rod should be placed, in preference, on the west side of the building. A rod of this kind may be put up by an ordinary blacksmith. The rod in question is in accordance with our latest knowledge of all the facts of electricity. Attempted improvements on it are worthless, and, as a general thing, are proposed by those who are but slightly acquainted with the subject.

Photographing on Wood.

Anthony's *Photographic Bulletin* gives the following process by A. J. Searing for photographing on wood for engraving purposes:

"The block on which the picture is to be made is first dampened with water, then whitened with enamel, rubbed from the surface of good enameled visiting cards. Rub gently, removing only the enamel, after which it is brushed smooth with a moderately stiff brush, from right to left and up and down, making a smooth, even, and very thin surface. Allow this to dry, after which it is flowed with a solution of albumen, made with the white of one egg and sixteen ounces of water, dried by heat or allowed to dry spontaneously. Now coat it with another albumen solution made as follows:

FORMULA No. 1.—White of one egg; water, 4 ounces; chloride of ammonia, 40 grains. Beat the whole to a thick froth. Allow to subside, then decant or filter through a fine sponge placed in a glass funnel. Pour a sufficient quantity on one corner of the block to cover it, when spread around with the aid of a ½ or ¼ glass (using the edge). Allow the surplus solution to drain back into the bottle. Dry this by a gentle heat.

FORMULA No. 2.—Ether, 1 ounce; alcohol, 1 ounce; gun cotton, 8 grains; nitrate of silver, 30 grains; dissolved in as small a quantity of water as possible, and allowed to settle for a few days, protected from the light. Flow the salted block with formula No. 2, in the dark room, and dry by gentle heat. It is now ready for exposure under the negative. A porcelain printing-frame, or any other suitable method, may be used to print it. After printing, formula No. 2 is removed from the surface of the block by dissolving in ether and alcohol, assisted by rubbing gently with a soft sponge. The picture can now be toned and fixed in the ordinary way, or fixed and toned at one operation, by the hypo and gold bath. After being allowed to dry, it is ready for the engraver.

The Multiplication of Insects.

A writer in the N. Y. *Evening Post* calls public attention again to this subject, and maintains that it is one of the principal causes of failure in fruit crops. He says so far as our observation extends their number seems to increase with every successive year. They attack the leaves; they attack the fruit, often as soon as it begins to set; they do not spare the branches, or even the trunks. They cause the apple and the pear to become small, knobby, and wormy, or to fall prematurely; they make the fruit of the cherry wormy, and worthless, or cause it to decay on the tree, and prevent the plum from ripening. We have seen medlar trees on Long Island covered with fruit, which was not in a single instance perfected, every medlar being bored through and through by insects, and made apparently as woody as the trunk. Downing's ever-bearing mulberry tree, in the same neighborhood, has its bark pierced in every direction with insects, and unless it is protected from them by some wash impregnated with substances distasteful or fatal to them, the tree perishes. Even the wild red mulberry trees in the wood suffer from the same cause, and die before they come to their full growth.

One of the causes of this extraordinary increase of insects injurious to vegetation is the destruction of the birds that feed upon them. We must take our choice between the insects and the birds. Birds multiply with comparative slowness, and if they prey upon the crops they can be seen and scared away. Insects multiply by myriads, and evade the attempts of man to destroy them. Birds take a small part of the fruit or ripened grain; insects destroy both by wholesale. There is nothing for us to do but to take the birds into partnership, allowing them a part of the annual product on condition of their protecting the remainder, as the traveler in the East pays a tribute to the Bedouin chief on condition of being protected by him from the robberies of his tribe.

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On Long Island the farmers have the habit of soaking corn in strychnine or some other poisonous substance and strewing it about their fields to prevent the depredations of the crows. There could be nothing more ill-judged than this. Not only crows, but other birds that make war upon the insect race, swallow the poisoned kernels and perish in consequence. But even if the crow only was destroyed, the effect would be mischievous. Crows feed upon grasshoppers, crickets, and other insects, and their stomachs are found full of them. A single insect which escapes them becomes the parent of thousands, and each one of these is the progenitor of thousands more, which move silently and surely to the work of destruction. If the crow cannot be kept from pulling up Indian corn by the old expedient of scarecrows, there is no other method but to replant, and set down the plants which he has pulled up to the account of profit and loss. The uprooting of a few plants would be a loss of far less consequence than the mischief from millions of destructive insects propagated without check.

In some parts of the country where the soil affords a convenient lodgment for insects, cultivators have abandoned the attempt to raise certains kinds of fruit. A gentleman living in the neighborhood of New Haven said to us not long since: "We have given up planting orchards of the apple-tree in our region. We find that we cannot raise fair, handsome, perfect fruit, on account of the mischief done by insects." On account of curculio, it is next to impossible for a plum to ripen on Long Island, where that fruit is now only known through tradition. The only way to remedy the evil seems to be to encourage the multiplication of birds.

Zerah Colburn.

It seldom falls to the lot of the journalist to discharge a sadder duty than that which we have to perform to-day in announcing the death of an engineer for several years connected with this paper, and whose name will be familiar to each one of our readers. On the 25th of April, Zerah Colburn was found lying in an orchard at Belmont, near Boston, U.S., whither he had wandered a day or two before from New York, mortally wounded in the head by a pistol shot fired by his own hand. Not yet dead, though dying, he was borne to the county hospital, where he expired a few hours afterwards. In this way has passed from among us an engineer whose abilities were sufficient, had they been but wisely directed, to raise him to any position that a member of the profession can reasonably hope to attain. Of the causes that led him to commit suicide it is not our place to speak.

To tell the tale of Mr. Colburn's life would be to place on record the biography of a man blessed with enormous mental powers; but, alas! too little permitted to be governed by those influences which tend to make a man not only great, but good. Such a narrative must proceed from other pens than ours. Of his connection with this journal it is, however, necessary that we should say something, and that something we may preface by stating that Mr. Colburn was born in Saratoga, State of New York, in 1832. As a boy he early manifested wonderful powers of memory, a passion for mechanics which influenced his whole life, and extraordinary energy and fitfulness of character. All things by turns—office boy, clerk, actor, poet, agent, engineer—but nothing long—he found his way to this country in 1857. For some time previously he had devoted his attention with considerable steadiness to journalism, and in 1858 he was already a practiced writer for the scientific press. His abilities attracted the attention of the founder and editor of this journal, and, at his request, Zerah Colburn wrote several articles, which were of so high a character that he was ultimately appointed to an influential position on the staff of *The Engineer*—eventually, for a time, occupying the post of editor in charge, while the responsible editor and proprietor was absent on the Continent through ill-health. The leading articles written by Mr. Colburn during this period have never been excelled in vigor, accuracy, and elegance of style. Nothing like them had ever before appeared in a scientific journal. It is to be regretted that they subsequently manifested in a few cases a lack on the part of their author of that spirit of strict impartiality which should be a distinguishing feature in an influential journal. Owing to this, and other causes, on the consideration of which it is not necessary to enter, Mr. Colburn ceased, in November, 1864, to have any connection whatever with the editorial department of *The Engineer*, although for a few months he was an occasional contributor to its pages. But even this connection, slight as it was, ceased in the spring of 1865.

Of the attitude subsequently assumed by Mr. Colburn towards *The Engineer* we prefer to say little or nothing. To speak favorably of it would be affectation; to tell the truth would be ungenerous to the memory of the dead. The facts are already familiar enough to many, beyond whom it is needless that any knowledge of them should extend. It is, however, not unreasonable to suppose that even at that time his mind, naturally ever restless and impulsive, had begun to lose its balance—that the insanity which has culminated in this last sad tragedy had already begun to develop itself.

Those who best know us will be most ready to believe that we find it impossible to speak of Mr. Colburn's melancholy death without deep sorrow. That in this country he has left few friends and many foes, as the result of a peculiar temperament which would not brook a moment's contradiction, is, we fear, but too certain. We trust that the good angel Charity will efface with tender hand the record of poor Colburn's faults, and leave for another generation the memory only of his virtues, his talents, and his good deeds.—*The Engineer.*

ACCORDING to Herodotus, coined money was invented by the Lydians.

Colored Fires.

The *Druggists' Circular* gives the following formulæ for the benefit of those persons who have occasion to prepare materials for Fourth-of-July displays or other *fire exhibitions:*

BLUE FIRE.—1. Tersulphuret of antimony, 1 part; sulphur, 2 parts; dry niter, 6 parts. This is the composition used for the Bengal or blue signal light employed at sea.

2. Sulphur, sulphate of potassa, and ammonio-sulphate of copper, of each, 15 parts; niter, 27 parts; chlorate of potassa, 28 parts. For theatrical illuminations. This may be rendered either lighter or darker colored by lessening or increasing the quantities of the sulphate of potassa and ammonio-sulphate of copper.

3. *Dark Blue*—Calcined alum and carbonate of copper, of each, 12 parts; sulphur, 16 parts; chlorate of potassa, 60 parts.

CRIMSON FIRE.—1. Chlorate of potassa, 4½ parts; charcoal (alder or willow), 5¾ parts; sulphur, 22½ parts; nitrate of strontia, 67½ parts. For pots.

2. Charcoal, 4½ parts; sulphuret of antimony, 5½ parts; chlorate of potassa, 17¼ parts; sulphur, 18 parts; nitrate of strontia, 55 parts. For boxes and stars.

GREEN FIRE.—1. Nitrate of baryta, 77 parts; chlorate of potassa, 8 parts; fine charcoal, 3 parts; sulphur, 13 parts.

2. Boracic acid, 10 parts; sulphur, 17 parts; chlorate of potassa, 73 parts. Very beautiful.

3. Chlorate of potassa, 18 parts; sulphur, 22; nitrate of baryta, 60 parts. For theatrical illuminations.

4. *Light Green*—Sulphur, 16 parts; carbonate of baryta, 24 parts; chlorate of potassa, 60 parts. Extremely delicate.

LILAC FIRE.—1. Black oxide of copper, 6 parts; dry chalk, 20 parts; sulphur, 26 parts; chlorate of potassa, 49 parts. For pans.

2. Black oxide of copper, 3 parts; dried chalk, 22 parts; sulphur, 25 parts; chlorate of potassa, 50 parts. For stars.

PURPLE FIRE.—Lampblack, realgar, and niter, of each, 1 part; sulphur, 2 parts; chlorate of potassa, 5 parts; fused nitrate of strontia, 16 parts.

RED FIRE.—1. Sulphur, sulphuret of antimony, and niter, of each 1 part; dried nitrate of strontia, 5 parts.

2. Chlorate of potassa, 20 parts; sulphur 24 parts; nitrate of strontia, 56 parts. For theatrical illuminations.

3. *Orange Red*—Sulphur, 14 parts; chalk, 34 parts; chlorate of potassa, 52 parts.

VIOLET FIRE.—1. *Dark Violet*—Alum and carbonate of potassa, of each, 12 parts; sulphur, 16 parts; chlorate of potassa, 60 parts.

2. *Pale Violet*—Sulphur, 14 parts; alum and carbonate of potassa, 16 parts; chlorate of potassa, 54 parts.

WHITE FIRE.—1. Charcoal, 2 parts; sulphur, 22 parts; niter, 76 parts. For theatrical illuminations.

2. Sulphur, 13¼ parts; sulphuret of antimony, 17¼ parts; niter, 48 parts.

YELLOW FIRE.—1. Charcoal, 1½ parts; sulphur, 17½ parts; dried soda, 20 parts; niter, 61 parts.

2. Charcoal, 6 parts; sulphur, 19½ parts. For pans. Very beautiful.

The ingredients of the above compounds are to be separately reduced to powder, and sifted through lawn, after which they should be kept in well-corked, wide-mouthed bottles, until the time of mixing them for use. The chlorate of potassa, more especially, must be separately treated, and cautiously handled, in order to prevent the possibility of explosion from friction while it is in contact with combustible matter. The requisite quantity of each of the ingredients being weighed out and placed on a clean sheet of white paper, the whole is to be thoroughly but carefully mixed together, with a "light hand," by means of a bone or wooden knife. The compound is next "lightly" packed into small cups or pans for illuminations, or into small pill boxes for stars and trains, a little priming or quick match being lastly attached to each. To *insure success*, the several ingredients must be dry and commercially pure; and though reduced to the state of a uniform powder, care must be taken that they are not absolutely "dusty," or too finely pulverized.

The nitrate of strontia, alum, carbonate of soda, etc., before being weighed, require to be gently heated in an iron pot or pan, until they fall to powder and lose their water of crystallization.

As the materials for colored fires rapidly deteriorate by by keeping, and even sometimes inflame spontaneously, to prevent disappointment and accidents they should not prepared long before they will be required for use, and should be stored in some situation in which their spontaneous combustion would be productive of no disastrous consequences.

The Electric Faro Box---The Greatest Gambling Invention of the Age.

One of the most ingenious inventions for fraud and deceit ever introduced to the "sporting fraternity" has recently been placed on private exhibition for the inspection of a few select gamblers. It consists of an electric faro box, so constructed as to permit cards to be secretly drawn, at the will of the dealer, without the possibility of the manner in which the movement is made being detected.

It will be first necessary to say to those who have never "fought the tiger" that a faro box is a very simple affair, usually made of some kind of metal, and is used to hold the cards which are presumed to be drawn singly while the game is being played, until the whole pack is exhausted. Every second card shown, except the first card, which is called the "soda," wins throughout the game. The first card shown loses.

This is the rule, although there are a few technical exceptions. The box is usually about 4 inches by 3 inches in size, and is fitted with springs which press the cards to the top whence they are released by being passed through a slot. In all square games but one card is passed through the slot at a time, although there are accommodation boxes which permit of all being drawn.

The electric faro box is very similar in construction to the box now in ordinary use among gamblers, except that it is is invariably made of steel or iron, and the springs for pressing the cards up are spiral instead of elliptic. Through one of these springs runs a wire which controls the magnet in the box. The table upon which the box rests is fitted in the usual plain way with the lay-out, the check-rack, and cases. Upon the lay-out, however, depends very much of the success of the fraud. This unpretending article is usually only a board covered with cloth, upon which is fastened one of each of the several denominations of cards in a full pack. These cards when used in connection with the electro faro box are oxidized and placed upon the cloth in such a way as to completely dispel all suspicion of their character. This is a part of the secret of the invention, and is claimed to be an entirely new thing in the science of electricity. Attached to these cards and running from each separately, are fine copper wires, which are placed under the lay-out board and run down through one of the table legs, where they connect with a battery under the floor.

The cards used may be of the common kind, but before being placed in the box they are immersed in a powerful magnetic solution, which is also held as a secret. When the game is about to open, and the dealer takes his seat, the table has the appearance of a very ordinary piece of gambling furniture. The box is produced and placed upon the table, immediately over a strip of oxidized cloth, highly charged with electricity, and the game begins. All the cards being magnetized, both in and out of the box, the current of electricity is made complete by a magnet skillfully adjusted in the box, which is always under the control of the dealer.

As all money at a faro bank is usually represented by chips some weight is placed upon a card when a bet of a y importance is made—for ten or a dozen chips will weigh several ounces. So sensitive are the cards on the lay-out that the slightest pressure is at once telegraphed to the representative cards in the box, and in consequence of their becoming magnetized they cannot be made to win unless the dealer breaks the current of electricity. This is done by an ingenious contrivance which detaches the magnet in the box when the current is off. Otherwise the cards, having been prepared for the purpose, would come out in pairs or double, very much after the fashion of braces used in all "skin games." This is not easy of explanation, except that every card on the lay-out corresponds with four similar cards in the pack, and that they are severally magnetized, so that any card upon which a bet is made must lose if permitted to come out double with another card. This is done through the slot, which is so arranged that a slight piece of steel can be moved so as to increase or diminish the aperture. In this manner the deal can be changed—a proceeding that all gamblers will readily understand.—*Electro-Telegraphic Review.*

A Concrete from Gas Lime.

It is well known that gas companies turn out of their works a quantity of lime which has absorbed certain impurities from the crude gas. Hitherto, the only use found for this offensive smelling gas lime, has been the very limited one of spreading it on the land and at the roots of trees for killing insects hurtful to vegetation. Of course this is out of the question in the case of the large city gas works, whose plant is too far removed from fields and orchards, and, although it is acknowledged that gas can be better purified by lime than by any other material, the trouble of removal of the waste product has forced the adoption of other methods which do not involve so much expense in carriage.

According to the London *Builder*, Mr. Thomas Prideaux, of Sheffield, has been exhibiting blocks of concrete, moldings, artificial stone slabs for hearthstones, and other objects, all made from this refuse gas lime; and as it is now the subject of a patent, and promises to furnish a useful material for building purposes, a short account of the results obtained up to this time may be useful. The gas lime is ground under edge stones, and presents at first a uniform green color. In this state it forms the raw material for making plaster or cement of various qualities and capabilities. According to the purpose required, it is used in this state, or it is calcined and reground and mixed with silicous matters. A wall may be covered with a smooth coat, which hardens free from cracks, for interiors; basements may be covered with a dry coat of cement, impervious, it is asserted, to damp, and quite obnoxious, be it remarked, to cockroaches. A hearthstone may be formed, and sets in a few days into a hard block of stone, as well as mantel-pieces and jambs, which, without any coloring matter, present a neat and stone-like appearance.

It is remarkable that the peculiar odor of the gas lime is no longer to be detected when the cement has set. The sulphur compounds are oxidized rapidly, and some of the adhesive qualities of the cement are no doubt due to the formation of calcium sulphate or plaster of Paris throughout the mass of the material in the process of hardening. A rubble wall can be built up and plastered over to resist the action of water in the interval of a tide, as the properly prepared cement will set even under water. The latter property has induced Mr. Prideaux to propose its use for building sea walls.

A number of houses in Sheffield, where trial has been made of this material, have been visited and inspected since its first application to walls, floors, and hearthstones, now about twelve months ago, and time only appears to tell in favor of its durability.

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Improved Street Pavement.

Our readers are well aware that one of the principal, as well as one of the most difficult problems with which inventive genius is at present grappling, is that of street pavements. Innumerable experiments and numerous failures are circumscribing the means whereby the desired end can be secured within constantly narrowing limits, and impossibilities as well as possibilities are becoming daily more defined.

So far nothing has been able to take the place of stone where pavements are required to undergo heavy trucking, and nothing has yet been discovered which makes so luxurious a road for pleasure driving as wood. Each of these pavements have their weak as well as their strong points. The weak points of the wood pavements are that they will not endure heavy work as well as stone, and many of them interpose serious obstacles to repairing sewer, water, and gas pipes. The weak point of the stone pavement is that for any thing but heavy trucking it is an abomination intolerable to the spirit of progress, general refinement and advanced civilization of the age.

Combining the good points of both these kinds of pavement, the inventor of the pavement herewith illustrated has sought to eliminate their defects.

The pavement is not designed for streets through which the heaviest kind of traffic passes, where stone alone is suitable; but for suburban towns and many of the quieter streets of New York and other large cities, it offers advantages which in our opinion entitle it to careful examination and trial.

It also is not liable to an objection which lies with more or less force against all kinds of composition pavements, namely, the difficulty of raising it for making repairs to water and gas pipes, and sewers. It consists of a composite pavement of longitudinal sections of Belgian or other stone pavement, arranged with special reference to gas, water, and sewer pipes, with intervening sections of wood or composition pavement of suitable width for pleasure driving.

The engraving represents a section and plan of a street of ordinary width, divided into longitudinal sections of suitable width, the stone-ways as well as the wood portions to be used when needed as drive-ways.

The central one, A, is laid with stone pavement of the Belgian or other style, under which the sewer is placed, as shown at B, in the section, Fig. 2.

On either side of this central way are laid wood sections, C, of the Nicolson, or any other style of pavement which may be preferred; or any other smooth kind of pavement of concrete may be used if thought best. Between these sections and the curbstones are laid the stone sections, D, which complete the road and form the gutters. Underneath these sections are placed the water and gas pipes.

Thus when repairs are needed in any of these pipes they are reached by removing the stone portions of the road, which may readily be replaced, while the wooden sections remain entirely undisturbed. They consequently endure much longer than when they are required to be taken up and relaid, and they afford ample, pleasant, and inviting surfaces for pleasure driving.

It is thought that this system will facilitate traffic and diminish the danger of collision by keeping the heavy trucks, on streets where heaviest trucking is done, entirely distinct from the lighter vehicles, and that travel might be so regulated that turning out could in great measure be avoided on such streets. It is also thought that the system would greatly increase the comfort of the traveling public, while increased durability and improved appearance of streets may be secured without material increase of first cost over that of stone pavements, while the cost would be considerably less than that of pavements made entirely of wood.

The cost of maintenance, which is the chief thing to be considered in connection with the expense of roadways, would be very much less than that of any other road of equal smoothness of surface and affording equal comfort and facility to travel.

Patented, April 26, 1870, by James C. Blake, Elizabeth, N. J., whom address for further information.

Fig. 1

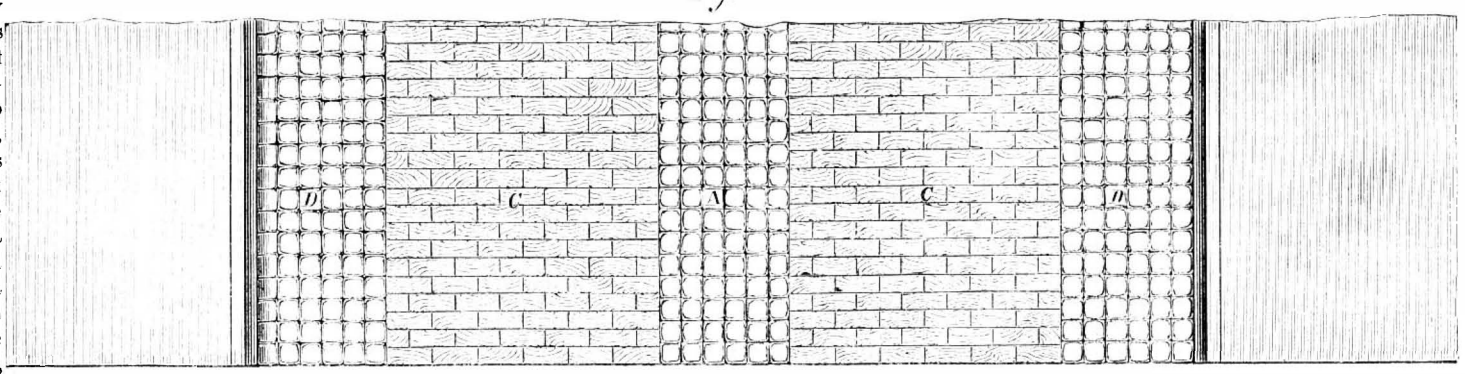
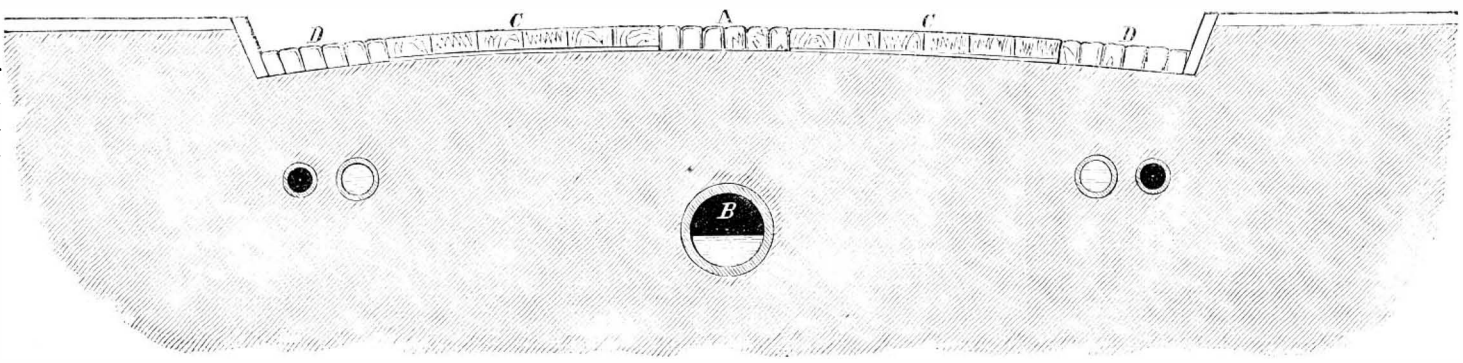


Fig. 2



BLAKE'S COMBINED WOOD AND STONE BLOCK PAVEMENT.

How They Do in France--A Valuable Suggestion.

They are adopting a system in France, in the manufacture of beet root sugar, not unlike our cheese factories in this country, to diminish the number of manufactories and build up fewer, but larger ones, at more convenient points. This is accomplished by laying down tubes from the farms to the factories, so that each farmer presses out his juice, and the underground tubes convey it to the factories. The Central Society of Agriculture of France of April 20, adopted a report detailing the operation of this singular process, and highly commended it and the inventor, M. Linard. About 180 miles of tubes have been in operation the past year, and have proved highly satisfactory. Five hundred miles will be completed the coming year. The advantages of it are, that it avoids all cost and trouble of transportation of the beets; it leaves all the refuse on the farm for the food of cattle or for manure; it avoids all danger of freezing, as the tubes are laid below frost. It enables factories to be located on navigable rivers or railroads, so that transportation is made easy at a minimum of expense.

In the first operation the juice was found to be changed in its passage through the tubes; but by adding one per cent of quick lime, all injurious change is prevented, and the juice arrives at the factories, not only not injured, but in a great measure purified. In one factory, 26,400,000 pounds of beets were used, which were supplied with about fifteen miles of tubes.

HOTTE'S IMPROVED COFFEEPOT.

This improvement is designed to afford a cheap means whereby people who are obliged to rise early and hurry off to business, and others obliged to take their lunch in works distant from home, and who cannot conveniently avail themselves of a restaurant, may be able to regale themselves at short notice with that most refreshing beverage good coffee.

It is also adapted for general domestic use in the extreme heat of the summer, when the use of a fire of the ordinary kind would be attended with much discomfort.

It is perfectly simple in its construction, and three or four ounces of charcoal is ample fuel to make and keep hot for a reasonable time, about a quart of the infusion.

The coffeepot is made with double walls, as shown in the engraving, leaving a chamber in the center. This chamber when the pot is in use is slipped over a tapering tube, A, a portion of which is broken away to show the fuel in its interior. The tube, A, rises from a stand, both it and the stand being made of sheet iron, and both being joined together by rolled joints. At the bottom of the tube, A, there is a perforated sheet iron plate, which forms a grate upon which the charcoal rests. Below the grate is a chamber, B, with apertures through which air is fed to the ignited charcoal, and through which, by means of lighted paper, the charcoal is readily kindled. An annular cover, C, is fitted to the top of the coffeepot, and a cover, D, is used to close the top of the tube, A, when the apparatus is not in use.

The burning of the charcoal gives rise to no smoke or ill odor, and the small quantity of gas generated may be allowed to escape through an open window or door, if found necessary. Patented, through the Scientific American Patent Agency, February 1, 1870, by George Hotte, whom address for further information, at 571 Hudson street, New York city.

Electric Light.

It is well known that, when bars of two different metals are made to touch each other and heat is applied at the point of contact, a comparatively powerful current of electricity is developed. A thermo-electric pile is a battery essentially made up of a number of such couples, the junctions of which can be heated at the same time. In the galena pile above referred to, a compound body —galena—is substituted for a simple metal. It may be generally stated that the amount of electricity produced on heating a thermo-electric pile is proportional to the number of couples employed. In the apparatus we have experimented with there happen to be one hundred and twenty couples.

When the pile was heated by an ordinary Bunsen gas burner and the electricity produced made to circulate round a very large electro-magnet, we were able to make the latter easily support a hundred-weight. Again: the current was passed through a small induction coil and a tolerably good succession of sparks obtained. Other experiments were made to test the power of the apparatus, but these we need not detail here. It is sufficient for our purpose to know that a comparatively intense electric current can be obtained in this way. If, then, one hundred and twenty couples are capable of producing a strong electric current, it is obviously only necessary to greatly increase the number of plates in order to obtain an amount of electricity capable of affording a strong electric light. This is the direction in which Mr. Fowler informs us two French physicists are working, and we have learned from other sources that they have already obtained very satisfactory results. If this be so, we may expect soon to see the thermo-electric apparatus employed in every well-fitted photographic studio, as the apparatus could be easily made to occupy but little space, and yet would be ready for use almost at a moment's notice.

At present the electric light is much less used for photographic purposes than it might be, as few persons care to expend much time in getting up a large galvanic battery, and the fumes which are sure to escape from it are by no means useful in a photographic *atelier*. Even Wilde's ingenious and beautiful machine cannot be much employed in the production of the electric light, owing to the necessity for using a steam or gas engine as a source of power. If, however, it was only necessary to heat a small gas furnace, in order to have the command of a powerful actinic light, we have no doubt many would employ the electric beam who now scarcely think of using it.

The above, from the *British Journal of Photography*, will, we trust, be a reminder to some of our American philosophers to continue their studies in the line of thermo-batteries. We believe that Moses G. Farmer, of Boston, Mass., is the inventor of one of the best batteries of this kind ever made; but we have heard nothing of its operations for three or four years past.

It is indeed desirable that we should be able to produce a strong electric light, without the nuisance of a great acid battery, or the steam boiler and engine. Perhaps it can be done by heat only, but we are inclined to think that a fire rather larger than that needed to operate the steam engine will be required.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

MOLECULAR MOTION.

There are many who seem to find a difficulty in forming a conception of molecular motion, or how it can possibly have any relation to the form, color, or any of the physical characteristics of bodies. Such people examine a piece of glass, steel, or other hard substance, and mentally regard it as a continuous aggregation without pores and without mobility of parts, and therefore can make nothing of the simple doctrine that all masses are aggregations of molecules or little masses, placed at wide distances compared with the dimensions of the molecules themselves. So we find that there still remain those who deny that there is aught in nature to justify the doctrine of universal molecular motion, and who can see no connection whatever between the properties of aggregated matter and motions of the particles which make up the mass.

It is undoubtedly true that of the molecules themselves we know nothing except their deportment toward each other as manifested in chemical reactions. We know neither their form nor their color. We do not know the peculiar motions they undergo; yet to believe that matter as manifested to our senses, is not made up of insensible masses, but is continuous, or to believe that its parts do not at all times move among themselves, is to deny some of the plainest and most obvious indications.

As we write, the whole structure in which we sit is in a state of vibration. Wave after wave rolls through it. Some of the waves are sound waves, some are light waves, and some are heat waves; while there are tremors transmitted through earth, stone, bricks, mortar, and table, from the wheels of heavy trucks in the adjoining streets, plainly sensible to our hand. When we consider how extremely sensitive to motion are all the kinds of matter known to man; when we reflect how the most solid and inflexible substances obey the influence of the most delicate pulsations of—so far as man's sense of feeling is able to determine—perfectly still air, it appears to us a far more violent conception to regard matter as existing anywhere in a state of rest, than to conceive of its infinite and constant activity.

But let us attempt to conceive of the relation of motion to form, solidity, etc. If it were possible for us to rotate a rectangular piece of any solid material at the rate of a million times per second, there would be presented to our senses a cylinder with a uniform surface, hard and impenetrable, with color depending upon the nature of the material. Any one may convince himself of this by revolving a wheel with numerous spokes at high speed, and observing its appearance. The spokes no longer appear as spokes, but present the appearance of a continuous disk. If the speed be sufficient, it is impossible to thrust a rod through between the spokes, for the resistance of each spoke is so quickly followed by that of the succeeding one, that the aggregate resistance is apparently continuous. A ring rapidly revolved about its diameter generates a sphere in the same manner.

These are simple experiments which prove that motion has much to do with apparent form, and the apparent physical properties of matter

If we spin a large flat metallic disk on its edge, we may witness the gradual transition of mass motion into molecular motion. The mass, as it loses its rotary motion, gradually moves through smaller and smaller arcs of vibration; the rapidity of the vibrations gradually increasing until they pass into the limits of molecular motion.

This extreme sensitiveness of all matter to the effect of external motion, renders it probable that nowhere in the universe is matter in a state of absolute rest. So far as we can determine by observation, every particle of matter is whirling through space at a rate which is almost inconceivable. Everything upon the surface of the earth is rushing around its axis at a rate of more than a thousand miles an hour, and the entire mass is shooting through space, in its orbit about the sun, at a rate of nearly two millions of miles per day. The slightest change in the position of the center of gravity would produce immense results at this enormous velocity.

When we connect such stupendous mass motion with the known sensitiveness of matter to motion in its parts, or molecules, how is it possible to entertain the notion that matter is anywhere at rest?

POTASH FROM FELDSPAR.

A correspondent asks the following question: "By what method may potash be extracted from feldspar, and is there any means by which granite may be treated to make it possess an agricultural value on account of the potash it contains?"

The mineral feldspar is widely distributed over the globe, and since the supply of potash from wood has greatly diminished, more attention has been paid to the extraction of this alkali from the rocks, such as granite and feldspar, that contain it in considerable quantity. Ordinary flesh-colored feldspar contains 13 or 14 per cent of potash. The white variety, called albite, has a large admixture of soda, hence, for potash, the reddish feldspar is preferred. A cheap method for decomposing the mineral and obtaining the potash does not appear even yet to have been devised; but several of the plans that have been tried are worthy of mention, and may serve as models to any one who is disposed to pursue the subject.

Sprengel, as long ago as 1830, prepared alum by submitting feldspar to the action of sulphuric acid. The mineral was reduced to a fine powder, and mixed with concentrated sulphuric acid to a paste, and the two substances left in contact with each other for several months. Treated with water, the mixture furnished a solution of potash-alum, so pure that re-crystallization was not necessary. A great difficulty to be encountered in this process was to grind the feldspar to a powder. In order to do this it is first necessary to heat it red hot, then to cool it suddenly in water, by which operation it is rendered friable, and can be ground under a mill-stone to a fine powder. In all of the processes employed for extracting potash from feldspar the same difficulty of reducing the mineral to powder presents itself, and the method indicated above is the one usually followed.

Another way of making alum was suggested by Turner, who fused the finely divided mineral with neutral sulphate of potash, and thus obtained on the one hand soluble silicate of potash, and, on the other hand, an insoluble double silicate of aluminum and potassium, capable of yielding under the influence of sulphuric acid, alum and silica. The soluble silicate of potash was digested with lime, when insoluble silicate of lime was formed, leaving potash in solution.

Another way that has been successfully tried in the Laboratory of Columbia College, was to fuse two parts of feldspar, with one part of quicklime and one part of gypsum, and to extract the potash by water. Much of the sulphuric acid of the gypsum will go to the potash of the feldspar and render it soluble. Kuhlmann, in a similar way, decomposed the feldspar by fusing it with chloride of calcium, by which an interchange of elements was effected, and chloride of potassium formed.

It has also been proposed to treat an intimate mixture of powdered feldspar and fluor spar with sulphuric acid—in this way the silica is got rid of as fluoride of silicon, and the sulphuric acid, which at first combines with the lime, afterwards unites with the potash and alumina to form alum. This process is capable of being worked out on a large scale, if the fluoride of silicon were to be economized and converted into hydrofluosilicic acid, as that acid is destined to have extensive and important applications in the arts—one of which applications would be the separation and saving of the potash in the beet sugar manufactory.

Mr. Meyer fuses feldspar with lime in the proportions of 139 to 188 parts of lime to 100 parts of feldspar—and extracting the potash by means of water under pressure. This process involves lixiviating 288 tuns of calcined product, at from seven to eight atmospheres of pressure, in order to obtain nine to eleven tuns of potash—which must greatly interfere with its introduction on a large scale.

Ward in England calcines a mixture of pulverized fluorspar, feldspar, chalk, and quick lime, and lixiviates the first with water, by which all of the potash is extracted. Professor Hofmann pronounces this to be the only method by which any of the experiments had succeded in obtaining all of the potash known to exist in the mineral; but although it had the sanction of his great name, it does not appear to have been conducted on a large scale by the inventor.

We have been led to speak of the various methods resorted to for the purpose of obtaining potash from feldspar, because we have frequent inquiries on the subject.

The operation cannot be carried on economically by any of the known methods, particularly since the discovery of the famous Stassfurt mines, where potash occurs in endless quantity, and can be manufactured cheaper than by any process hitherto known. The time is approaching when the greater portion of the potash of commerce will be obtained from the Stassfurt mines.

THE SCHOOL OF MINES, COLUMBIA COLLEGE.

This institution is under the direction of the trustees of Columbia College, and although of comparatively recent growth, has already advanced to the front rank of our American schools. It was originally founded, as its name indicates, to fit young men for the profession of mining, but in process of time it was found necessary to enlarge its scope so as to include engineering, technology, and natural history as well as mining. During the first year all pupils alike pursue mathematics, physics, chemistry, French, and German. This is looked upon as a preparatory year for what is to come. The second year makes some changes and opens the door to the selection of a certain class of optional studies for those who are to be mining engineers or civil engineers. The class still adhere closely to the study of chemistry, physics, mathematics, French, and German, and they commence their practical studies in the laboratory. The first year in the laboratory is devoted to instruction in manipulation, in qualitative analysis, in the determination of minerals, and certain glimpses of geology are obtained.

From the outset the students are taught drawing, and are urged to devote much attention to this important branch of education. The last two years of the course are full of instruction in geology, mineralogy, chemistry, assaying, and metallurgy, and by the time the student is prepared to graduate, he will have received a thorough instruction in all departments of natural science, in mathematics, in modern languages, and in everything that fits a man for the practical details of a profession.

The collections of the school are unusually rich in rare and valuable specimens. The mineralogical cabinet is said not to be excelled by more than one or two in the country, while the geological collection is believed to be the best in the United States. The library is well stocked with books of reference and the leading scientific periodicals of the day. The laboratories of the school are more extensive than any in this country, as they afford accommodations for one hundred working students. An important feature of the school is the fact that a thoroughly worthy student who can show that he cannot pay, is permitted to attend gratuitously. The trustees of Columbia College have sufficient income to carry on the institution without taking any fees from the students if at any time it were deemed expedient to do so. A goodly number of free students are constantly in attendance at the school, and no one is aware of the fact but the President and treasurers. The school will soon close for the year to be re-opened in October.

CONDUCTION AND CONVECTION OF HEAT.

The distinction between these terms is not popularly well understood. Thus it is common to hear people speak of water or air as conducting heat, while on the contrary talk about metals conveying heat is nearly as common and still more absurd.

The distinction between these terms is a very important one, and lies at the very foundation of a correct understanding of the laws of the transmission of heat. A short space may therefore be profitably occupied in the discussion of this subject.

Heat motion, or that "peculiar shivering motion of the ultimate particles of bodies" as Helmholtz so aptly defines it, is communicated in only three ways. These are called respectively *conduction, convection,* and *radiation.*

The conduction of heat is that form of transmission in which heat motion passes from particle to particle through a mass, the particles themselves sensibly maintaining their relative position. If a metallic bar has one end thrust in a fire, portions of the bar remote from the fire become hot. The bar meanwhile retains its form, save that its bulk is increased by the expansive force of the heat. There is no sensible evidence that the particles have changed their relations of position except that expansion of the bar indicates that they have separated somewhat. The motion is transmitted throughout the mass precisely as the vibration caused by the blow of a hammer would be, or the vibration caused by drawing a fiddle-bow over one end of the bar, with this exception, that the rapidity of the vibrations and the rates of transmission vary from causes not necessary to be here discussed.

Convection, or the carrying of heat, is quite a different process. In this case the particles change their positions in regard to each other. When those nearest the source of heat become heated, they expand, and becoming lighter in proportion to their bulk than the non-heated particles, they rise and colder particles take their place. Of course this cannot occur except in bodies the particles of which move freely among each other; and as fluid bodies are the only ones that answer this condition, it follows that they are the only conveyers of heat.

We see then that the best conducters of heat must be solids, and the worst liquids or gases, which are the best conveyers of heat; and that convection depends upon gravity which pulls down the specifically heavier particles and thereby pushes up the specifically lighter ones.

It does not follow that liquids or gases inclosing a space are therefore efficient in imprisoning heat within it, or preventing heat from entering. Such efficiency would depend upon collateral circumstances as well as the non-conducting power of the surrounding medium.

A non-conducting but a conveying medium, placed between two good conducting surfaces—these surfaces being kept at different temperatures—would be in constant motion, conveying heat from the hotter to the colder surface; and the philosophy of filling such a space with some loose material as wool, is that it imprisons the conveying medium in its interstices and prevents in a very great degree its circulation.

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Mistakes in the construction of refrigerators have been recently brought to our notice, caused by the supposition that a space filled with air between two metallic cases would be more effective than any other filling, while superior lightness would thereby be secured.

Mistakes in the construction of steam boilers are also common results of want of knowledge of the laws of transmission of heat.

But the most absurd errors occur and abound in the construction and erection of heating and ventilating apparatus. We scarcely ever see anything of this kind in public or private buildings which is not open to criticism in some important particular. It would almost seem that intentional violation of natural laws was the object in some of these arrangements. The old saying that heat *rises* seems to be generally accepted as truth by constructors of heating apparatus. Thus we know of a case where it is expected that heat will rise through a long, narrow, vertical passage, the bottom of which surrounds a fire-box, and has no communication with the external air.

In the case cited, which is a fair sample of blunders to be met with in school-houses, churches, etc., throughout the country, a very little heat escapes from the open mouth of the tube above; the amount thus imparted to the room it is intended to warm being only that due to a little radiation, and the circulation of the air in the tube, which latter, under the circumstances, is very slight. The consequence is that the upper room is never warm while the lower one is continually overheated in a vain attempt to warm the upper one. A good sized hole in the bottom of the tube, and another in the bottom of the upper floor, with a tube leading from it down nearly to the floor below, would enable the heat to be equally distributed thoughout the building, and necessitate much less expenditure of fuel.

Heat does not always rise any more than it always falls or moves laterally. It goes just as it is conducted, conveyed, or radiated, and it is only by understanding this truth and acting in accordance with it that any apparatus intended to transmit heat, or to prevent its transmission can be made efficient.

ARE TIN FRUIT CANS A SOURCE OF METALLIC POISONING?

Our attention has been called to this subject by a note of inquiry from a lady in Brooklyn, Miss Julia Colman, who has achieved considerable popularity as a temperance lecturer, and has made the subjects of food and nutrition a favorite study.

The queries she propounds are, we think, of sufficient importance to merit public attention, which, once aroused to the subject, will not, we trust, be content until a positive answer is obtained to the query which forms the heading of the present article.

Tin has long been justly regarded as one of the metals from the ordinary uses of which mankind have nothing to fear. But the present age is characterized by its factitious imitations. That which goes by the name of tinfoil is mostly an alloy of tin and lead, and it is charged that many of the caps used for glass fruit jars are made of zinc instead of tin. It is well known also that lead is used in soldering cans, and that this metal is attacked by certain organic acids, which are contained in fruits. The tin of commerce is also by no means pure, and housekeepers will vouch that the tin cans are often attacked by these acids, and eaten through so as to leak their fluid contents. In the case of impurities in the tin used to coat the iron of the tin plates of commerce, when the cans are thus attacked, it may well be doubted whether the cumulated effects of metallic poisoning do not sometimes result from this cause.

Our correspondent writes as follows:

"So far as the evidence of the senses goes, housekeepers know that cooking tomatoes in tin 'ruins the basins' as one good woman said; and another admitted that she commonly used up at least one 'basin' in a season for this purpose. How much injury the partaker receives we do not know, but so much has been said of the sad effects of metallic poisoning, even in small though long continued doses, that we would like to be assured of safety. Professor Youmans thinks it a small matter, but I find that many medical authorities disagree with him. One of the latter says: 'It ought to be known to housekeepers that acid, fatty, saline, and even albuminous substances may occasion colic, vomiting, etc., after having remained some time in tin vessels.'

"We see that the inner surface of the tin can is discolored after having been used for fruit, and we find that the flavors of the more delicate fruits are injured when they have been kept in tin cans, but whether the acid acts after the expulsion of the free oxygen, or only during the canning process, we do not know.

"Zinc is more readily oxidized than tin, and yet the caps of some of our glass cans are made of that substance.

"Many if not all the tin cans are freely soldered with lead, and it *seems* inevitable that the usual galvanic action must result when they are filled with an acid.

"I have no desire to raise a false alarm, indeed I should be much gratified to learn that such a use of tin cans is perfectly safe, since many depend on them for all their canned fruit.

"If the amount of tin that may enter the system, as a result of its domestic use, is not likely to prove injurious, the questions are narrowed down to the purity of the article used and the actual results of using the various cans prepared for our market.

"I had an opportunity recently to make some inquiries of Profesor Edwards of the 'Woman's Medical College of the N. Y. Infirmary,' and he said that the tin cans, *as prepared*, are very unsafe, that the acids dissolve the lead solder and sometimes eat through the entire plate, making the cans leak (a new fact to me), and also that serious cases of poisoning had occurred from using their contents. If facts like these could be called out from scientific men they would arrest public attention, and they might suggest to manufacturers of glass cans the desirability of protecting the inner surfaces of their metallic caps in some way. Those with metallic caps work so much more easily than others, that they will long be more or less in demand. (Professor Edwards, however, said that the metal used in them is lead). I line mine with stiff white paper, a small protection of course."

We believe the subject thus broached by our correspondent is one of importance. If manufacturers are presuming upon popular ignorance, and palming off upon the public zinc and lead for tin in vessels intended to contain food, the fact ought to be known. Acetic acid acts slowly upon lead, but its action is hastened by exposure of the metal to air. Acid fluids act with more violence upon zinc.

According to Miller commercial tin may and usually does contain (except the Banca tin, which is not used for tin plates) small quantities of copper, arsenic, iron, and lead. Of these adulterations all but the iron are poisonous. The copper as well as the lead is acted upon by vegetable acids. In the gradual destruction of vessels made of tin plates by culinary use, it would seem that more or less of the poisonous salts of the metals named must enter the food prepared in them. Whether this amount is sufficient to affect health is a question that ought to be decided.

THE MYSTERY OF SLEEP.

What are the differences between sleeping and waking? What is the peculiar nature of that mysterious condition which we call sleep? These are questions long and earnestly asked but never answered. There is something about this phenomenon that seems to defy investigation. The distinctions between the sleeping and waking state are, save a few external differences, as entirely unrecognized to-day as they were ages ago.

Sit by the cradle of a child and watch it as it sinks into quiet slumber. The muscles gradually relax; the eyelids fall; and voluntary motion ceases. The breathing is slower, as is also the action of the heart. The temperature of the body is slightly depressed; and a state of apparent unconsciousness accompanies the physical changes specified. That is all we can see, and yet it seems hard to believe these things are all that constitute sleep. If so, sleep might be accurately defined as a simple cessation of volition, or the action of the will, so that thought and motion of all muscles except those of the vital organs is impossible. But a little thought will show that cessation of will is only one of the manifestations of sleep, and that the will may and frequently does only partially cease to act, retaining command of the voluntary muscles, and giving rise to the phenomenon of somnambulism. At times also the mind becomes active in sleep, and often reasons with surprising coherence, and dreams, more or less approximating to realities of waking hours, are produced.

But the mystery of mysteries pertaining to sleep, is the fact that it renovates the system from fatigue. And after all, this is no greater mystery than fatigue itself. What is fatigue? In what state of mind or body, or of both, does it consist are questions the answers to which still puzzle the profoundest physiologists.

The periodicity of the desire for sleep is another peculiarity which is still involved in mystery. Why is it that darkness, monotonous noises, the fixing of the eyes upon some stationary object, all favor the approach of sleep? On all these points there is still no certain light. Upon respiration, digestion, circulation, reproduction, and assimilation, some accurate knowledge exists, but of sleep almost nothing. This function which influences more or less every other, and which has been aptly described as "a partial death from which springs a fresher life," is apparently no less remote from present means of scientific investigation than the greatest mystery of all, life itself.

PRIMARY SCHOOL EDUCATION.

If we analyze the working of the mind in performing a train of reasoning, we shall find that comparison or contrast is the principal part of the operation. Thus, in classification we first compare the object or idea to be classed with similar ideas or objects, and place it in the category with which it corresponds. In ascertaining the differences between objects or ideas we compare them. Says Max Muller, "all higher knowledge is gained by comparison, and rests on comparison. If it is said that the character of scientific research in our age is pre-eminently comparative; this really means that our researches are now based on the widest evidence that can be obtained, on the broadest inductions that can be grasped by the human mind. What can be gained by comparison?—Why, look at the study of languages.—If you go back but a hundred years and examine the folios of the most learned writers on questions connected with language, and then open a book written by the merest tyro in Comparative Philology, you will see what can be gained, what has been gained, by the comparative method."

It is thus that we form judgment upon relative size, weight and color of bodies, as also texture, form, and all other physical properties which our senses are able to detect in masses of matter.

And even when we pass beyond the realm of physics and indulge in metaphysical speculation—which it is to be hoped few are often tempted to do—we shall find that we cannot even speculate without comparison.

If then we learn so much and reason so much through this operation, it is of the first importance that we should be able to do it correctly. We venture to affirm that in the want of ability to make just comparisons is found the explanation of the inferior judgment of the masses upon all great questions, and their willingness to accept opinions ready made, from the, so to speak, "slop shops" of pseudo philosophers and political economists, and quacks who live upon public credulity and grow rich upon the sale of manufactured opinion to those too indolent or too weak to think for themselves.

We recently read a leading article in a daily cotemporary lauding the immense benefits of trial by jury, because—as it maintained—by this means, whatever the law may be, a decision in accordance with the public opinion of average men is certain to be obtained. Something might be said in regard to a doubt whether in the present system of impanneling juries we really get average men. For our own part we feel that if this is the case, the average intellect is humiliatingly, if not dangerously, small in this country. But admitting that average intellect and average integrity are secured in the jury-box, we have still graver doubts as to whether questions of law and medical jurisprudence are subjects with which the average intellect is competent to deal. When a man begins to think independently, and to accept his conclusions without reference to popular prejudice, his intellect may be set down as above the average.

It will be seen from what we have said that we believe the power of making just comparisons, of contrasting things and ideas to detect their specific points of similarity or difference, is small in the majority of minds, and as we further believe that this is a fault rather of education than of natural endowment, we should not have done much good in pointing out the defect without we could suggest a remedy.

There has latterly been developing in this country a system of primary training known as object teaching. This system makes the first and principle end in the instruction of youth to the development of the power of comparing things and ideas. To this end it brings skilled minds into contact with untrained mind, the skilled directing the unskilled, and correcting its errors, and by practice teaching the infant mind to use judiciously the avenues by which knowledge enters the mind. Thus the sense of touch, of sight, of smell, of taste, and of hearing, are each educated as they should be, for it is our firm belief that the basis of a sound system of instruction is education of these senses. Let a child be first trained to gain correct impressions of external objects, and there is little fear that when he comes to finally apply his intellect to abstract ideas, that he will be satisfied with imperfect and crude notions.

This system of instruction has however met with serious obstacles from the prejudices of people, who imagine that a book is the only medium through which knowledge can be gained, and who are content to measure progress by pages, and problems traversed, rather than by growth of mind and strength to grapple with facts.

It is one of the most encouraging signs of the times that the progress of science is remodeling systems of instruction, sweeping away old barriers and disseminating new views on the subject of education, and we believe the time will come when it will be generally seen and conceded, that primary instruction may be better accomplished by the oral system, and by directing the young mind to think and observe for itself, than in the method of compulsory cramming so long in vogue, and soon we hope to become obsolete.

A NEW ALKALOID IN OPIUM.

In 1803 Derosene discovered a crystalline body in opium, and, in 1817, Serturner described its properties. This was the first discovery of a new class of bodies called vegetable alkaloids, and, consequently, points an era in the history of chemistry. Since then, more than one hundred analogous bodies have been discovered, and we count among them some of our most prized medicines. We need only mention quinine, narcotine, strychnine, brucine, theine, nicotine, conine, morphine, codeine, etc. Since attention was directed to opium by the labors of Serturner, chemists have discovered in that gum a large number of different alkaloids, representing the peculiar properties of the medicine, and it was supposed that this field of research was exhausted. It appears, however, that still another base has been discovered. The new body has the same chemical composition as morphine, minus the elements of water. Its special therapeutical property is, that it is deprived of the narcotic effects of morphine, and acts as a powerful emetic. Injected sub-cutaneously in minute quantities, it produces violent vomiting in the course of five minutes. This property is so strong that the chemists who prepared it had great difficulty to overcome the constant feeling of nausea superinduced by it. The new body was discovered by Messrs. Matthiessen & Wright, of Saint Bartholomew's Hospital, London; and if all that has been said of it be confirmed by subsequent experiments, it is destined to play an important part in medicine.

Skilled Industry in America.

The position given in this country to skilled industry is awakening general attention. Now that measures are taken to place permanently a National Exhibition in this city, public men of other countries are calling attention to the matter. It is generally overlooked that a large proportion of the population of the Atlantic States are classed as artisans, who comprise no less than two-thirds of the workingmen in Maine, one-third in Massachusetts, one-fourth in this State, three-fifths in Maryland, and five-sixths in the city of Philadelphia.

Lord Clarendon, Secretary of the British Legation, in his report to Parliament, makes the following statement:

"There are few countries in which the workingman is held

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in such repute as in the United States of America. The laboring classes may be said to embrace the entire American nation. The American prefers the occupations in which the exercise of the brain is in greater demand than that of the elbow. His chief ambition is to attain to the position of a master workman."

THIRTY-NINTH INDUSTRIAL EXHIBITION OF THE AMERICAN INSTITUTE.

The Board of Managers of this association have issued circulars announcing their thirty-ninth exhibition, which will be held at the Empire Skating Rink, on the Third avenue, between Sixty-third and Sixty-fourth streets. The premises, lately enlarged and improved, will be opened for the reception of goods on Monday, August 29th, 1870, and on Wednesday, September 7th, the Grand Exhibition will be formally opened to the public by an address at 12 o'clock, M. It will remain open every secular day from 9 A. M. to 10 P. M., until Wednesday evening, November 2, 1870, when the closing address will be delivered, and awards to successful competitors announced.

Circulars containing full information may be had on application to the "Corresponding Secretary of the American Institute, New York," who will also send blanks and give any desired information to parties desiring to become exhibitors, and will receive and file all applications for space.

CINCINNATI INDUSTRIAL EXHIBITION.

This exposition will be held under the joint auspices of the Chamber of Commerce and the Board of Trade of the city of Cincinnati, and the Ohio Mechanics' Institute, commencing Wednesday, September 21, 1870.

It is the expressed desire of the managers to make this exposition of art and industry superior in point of attraction and practical benefit to all concerned, to any display of a similar nature which has ever been held in that city.

They hope to see art and mechanism fully represented. Steam power for driving machinery will be furnished. Any desired information will be obtained by addressing the "Secretary of the Cincinnati Industrial Exposition," who will furnish rules and blank applications for space.

NEW MECHANICAL MOVEMENTS.

On page 192, present volume, we gave the following problems for solution:

"PROBLEM 1.—Required to convert the rotary motion of a pulley into a horizontal intermittent rectilinear motion, first in one direction and then in the opposite direction, without the use of a pitman, pulley, toothed wheel, cam, cam groove in a pulley, or a flexible band, the first rotary motion to be constant and uniform. In other words, let it be required to move a piece of metal, wood, or other material, to a certain point where it shall pause, and then again move on a certain distance and again pause, and so on successively as far as desired, when it shall return to the point from which it originally started in the same intermittent manner and under the conditions above specified.

"PROBLEM 2.—Required to produce a variable rotary motion in a shaft driven directly by a belt from a pulley having a uniform constant rotary motion, without the use of anything but the one belt and the two pulleys; no cone pulleys or their equivalent to be allowed. All the motions to be continuous and in the same direction.

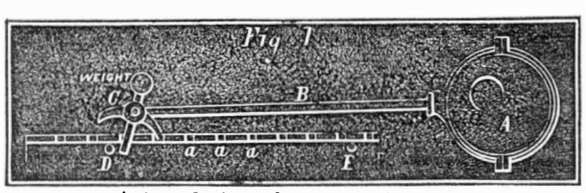
"PROBLEM 3.—From a reciprocating body to communicate reciprocation to another body, so that the second shall make four reciprocating movements for every reciprocation of the first; the motions of these bodies to be in lines parallel to each other, and the pieces to be connected by only three moving parts, which parts shall be neither wheels nor pulleys of any kind, and no inclined planes, cams, belts, or flexible cords, cranks or bell cranks to be allowed, and no radial motion from a fixed center in any piece employed."

We are happy to announce that each of these problems has received a correct solution, and we have engraved some which could hardly be understood by a mere verbal description.

Problem 1 seems to have received the greatest share of attention, and we have received a number of solutions which do not comply with the enunciation of the problem. One of these is, however, sufficiently ingenious to be noticed, notwithstanding it is an

IMPERFECT SOLUTION.

"An eccentric pulley is allowed in the solution of Problem 2, page 287, Vol. XXII., SCIENTIFIC AMERICAN, and I there-



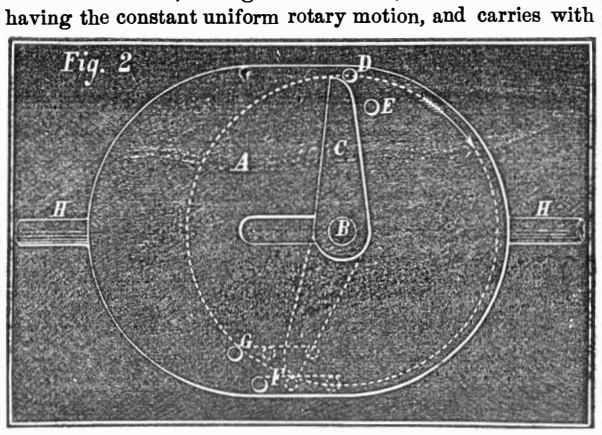
fore use one, A, in solution of Problem 1. Yoke this eccentric pulley to a rod, B, in the usual manner; on this rod is the simple double pawl, C, which engages in the notches, a, a, a, a, etc., and gives horizontal, intermittent, rectilinear motion in one direction as above. At the next stroke of the eccentric, a pin at D may trip the pawl, and we will then have horizontal intermittent motion in the other direction, until another pin, say at E, again reverses the motion.

Salem, N. C. J. W. FRIES."

We consider this solution faulty because the eccentric may be regarded as the equivalent of a crank in this instance, and if so regarded, the rod, B, is the equivalent of a pitman. The latter is not allowed by the conditions of the problem.

TRUE SOLUTION OF PROBLEM 1.

"A, Fig. 2, represents the piece that has the intermittent, rectilinear motion, sliding with the rod, H. B is the shaft having the constant uniform rotary motion, and carries with

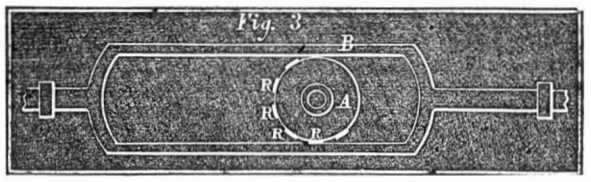


it the wiper, C; this successively engaging with the pins, D, E, F, G, imparts the motion required, the number of intermissions being varied with the number of pins. I have made a model of this movement, and it works in all respects as described. WM. M. MOORE."

Niles, Mich.

SECOND SOLUTION OF PROBLEM 1.

"The wheel, A, Fig. 3, is the given pulley, having a uniform rotary motion. R, R, represent rubber pieces fastened upon

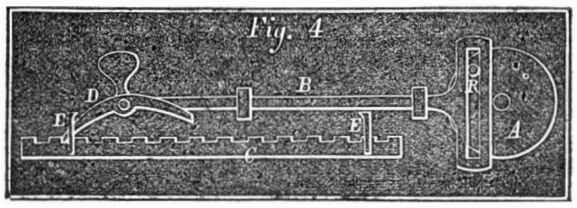


one half of its perimeter, the action of which upon the yoke, B, will produce the intermittent reciprocating motion required.

Toledo, Ohio. COURTNEY HEATH."

THIRD SOLUTION OF PROBLEM 1.

"The following is another form of movement, which I believe to be a true solution of problem 1. The given pulley, A, Fig. 4, carries a wrist, R, which works in the slotted yoke,



B. The end of the arm, B, carries a double pawl, D, which works in the rack, C. E, E, are stops for removing the pawl, D. IBID."

PROBLEM 2.

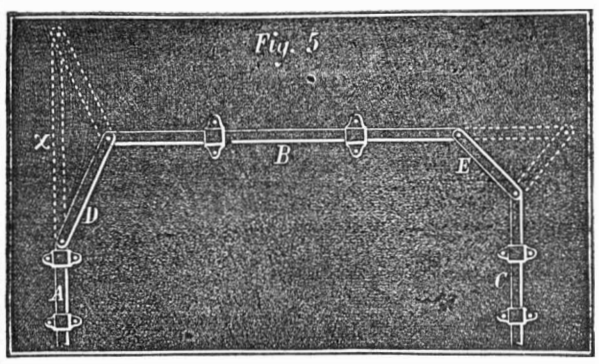
Several solutions have already been published for this problem, see page 287. E.A. T. of Philadelphia, Pa., sends still another, which we are inclined to think is not new, but will nevertheless give it. It is simply two eccentric pulleys of equal throws, connected by an inelastic belt.

PROBLEM 3.

But one solution for this problem has been received that can be accepted as new, and also as correct. The author of the movement, shown in Fig. 1, favored us with one, but it has a radial movement from a fixed center in one of the pieces, which is not allowed in the specified conditions.

TRUE SOLUTION OF PROBLEM 3.

The bar, C, Fig. 5. is the body required to make four reciprocations, while the bar, A, makes one. Move the bar, A,



up to the point x, and the bars, B and E, will take the position shown by the broken lines on the right. The bar, C, will have made one whole reciprocation. Continue the motion of A to the position shown by the broken lines on the left; C will then have made two reciprocations. Move A back to its original position, and C will have made four reciprocations, while A has made but one. This beautiful link motion is the invention of the author of the movement shown in Figs. 3 and 4.

Sweet Potato Experiments.

The *Western Rural* states that Colonel Baylor, of Georgia, aided by some scientific gentlemen in Boston, has been for some time conducting a series of experiments upon the sweet potato. The articles produced are starch, dextrine sugar powder, a sweet kind of vegetable flour. It is said that there is a variety of sweet potato cultivated in the Southern States which will yield ten per cent of cane sugar.

It is estimated that the sweet potato crop of Georgia, properly manufactured for commercial purposes, would add from $10,000,000 to $15,000,000 to the wealth of that State. The value of the manufactured crop in North Carolina would exceed this sum.

PATENT OFFICE AFFAIRS.

The business of the Patent Office is now in a flourishing condition, and the present is a favorable time to enter applications. Inventors will find the SCIENTIFIC AMERICAN PATENT AGENCY ready to attend to the prosecution of claims with the greatest dispatch. By reference to our register, we find that we have made upwards of twenty-four thousand preliminary examinations into the novelty of alleged new inventions. This great experience, together with the fact that a large proportion of all the business with the Patent Office, for the past twenty years, has been conducted through this Agency, suggests to inventors the surest and best means to secure their rights.

We give opinions free, and all we require is a rough sketch and description of the invention.

Inventions patented through this Agency receive notice in the SCIENTIFIC AMERICAN.

MODELS.—In order to apply for a patent the law requires that a model shall be furnished, not over a foot in any of its dimensions, neatly and substantially made. Send the model by express, prepaid, addressed to Munn & Co., 37 Park Row-New York, together with a description of the operation and merits of the invention.

CAVEATS.—Whenever an inventor is engaged in working out a new improvement, and is fearful that some other party may anticipate him in applying for a patent, it is desirable, under such circumstances, to file a caveat, which is good for one year, and, during that time, will operate to prevent the issue of a patent to other parties for the same invention. The nature of a caveat is fully explained in our pamphlet, which we mail free of charge.

EUROPEAN PATENTS.—Probably three-fourths of all the patents taken by American citizens in Europe have been secured through the SCIENTIFIC AMERICAN PATENT AGENCY. Inventors should be careful to put their cases in the hands of responsible agents, as in England, for example, the first introducer can take the patent, and the rightful inventor has no remedy. We have recently issued a new edition of our Synopsis of European Patent Laws.

All communications and inquiries addressed to Munn & Co., respecting patent business, are considered as strictly confidential.

Death of Mr. Dickens.

As we go to press the telegraph brings us news of the death of the great novelist, Charles Dickens, than whom no writer of his time has become more widely known and admired. The writings of Mr. Dickens have all been in the interest of humanity, and no more fitting epitaph could be engraved upon his tomb than

"Write me as one that loved his fellow man."

His death will be lamented by the intellectual and the good of both hemispheres.

AN express train on the Alleghany Valley Railroad, running at the rate of forty miles an hour, was lately brought up all standing against an obstruction on the track, consisting of rocks and dirt, the result of a land-slide. This train was fitted with Miller's platforms, buffers, and couplers. Notwithstanding the fearful velocity of the train no lives were lost, as the cars did not telescope, as ordinary fastened cars would have done under the same circumstances. Miller's inventions should be adopted on all railroads without delay. On the Missouri Pacific Railroad nineteen passengers were lately killed by the telescoping of the cars.

HARD ON THE M.D.'s.—Dr. Charles Elam has lately written a work in which he undertakes to prove, and asserts he does prove, that the practice of medicine of to-day is less efficient, performs fewer cures, and is less able to check disease than it was thirty years ago.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,237.—SUPPORTING AND GUIDING APPARATUS FOR MACHINES FOR SEWING BOOTS AND SHOES.—Daniel Mills, New York city. April 30, 1870.

1,255.—BUCKLES OR BALE TIES.—E. J. Beard, St. Louis, Mo. May 2, 1870.

1,257.—HOISTING MACHINE.—Henry Reedy, Cincinnati, Ohio. May 2 1870.

1,261.—MACHINERY FOR PRINTING UPON SPOOLS FOR THREAD, ETC.—Ira Dimock, Florence, Mass. May 3, 1870.

1,286.—STEAM ENGINES.—Babcock and Wilcox, Providence, R. I. May 5, 1870.

1,324.—MACHINERY FOR KNITTING LOOPED FABRICS.—John Pepper, Lake Village, N. H. May 9, 1870.

1,215.—APPARATUS FOR ABSORBING THE OVERFLOW OF OIL IN HYDRO CARBON AND OTHER LAMPS.—L. E. C. Moore and J. S. Hamilton, Pittston Pa. April 27, 1870.

1,289.—SAFES, ETC.—T. Hyatt, New York city. May 5, 1870.

1,313.—STAMP.—Towle and Harding, New York city. May 7, 1870.

1,323.—NUT LOCK.—R. Rutter, Vallejo, Solano county, Cal. May 9, 1870.

1,335.—ILLUMINATING GAS APPARATUS.—M. H. Strong, T. Barbour, and C C. Conner, New York city. May 10, 1870.

1,336.—BREWING ALE AND OTHER MALT LIQUORS.—James McC Boston, Mass. May 10, 1870.

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1,351.—MACHINERY FOR POINTING AND FINISHING NAILS.—Sebastian Schlesinger, Boston, Mass. May 11, 1870.

1,358.—GRATE BARS.—Jonathan Cone, Bristol, Pa., and John McEldery, Jersey City, N. J. May 12, 1870.

3,610.—PROJECTILES.—A. F. Potter, San Francisco, Cal. May 12, 1870.

1,345.—PADDLE WHEELS.—W. F. Knowlton and M. McComb, St. Cloud, Minn. May 11, 1870.

Universal Clothes Wringer.

But one invention has held its own in the household, and that is the Clothes Wringer. We have used one of those whose name heads this article, for ten years, and it has done good service during that time, although in weekly use. We consider the fact, that the frame and all parts of the machine are made of wood, to be in its favor. There can be no possibility of injury to the clothes by rust. Another advantge of this Wringer, is that of a patent stop, in the form of a screw, placed over the wheels, preventing them from getting out of gear. But the principal advantage of this wringer over others, is the patent double gear. This is the invention of the late Dr. Warren Rowell, and one of the best devices in mechanical movements that has come under our observation for a long time.—[N. Y. Mechanic, Dec. 1, 1869.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 17c. a line.

Glass Cutters' Grindstones, made by machinery—Craigleith, 40c.; Newcastle and Nova Scotia, 8c. an inch. J. E. Mitchell, 310 York avenue, Philadelphia.

Catlin's Patent Self-closing Barrel Filler for filling packages with liquids of any kind. See other advertisement, and address, for circular, S. C. Catlin, Cleveland, Ohio.

Keane's Silver-plating Compound plates metals with pure silver instantaneously. Keane, Silver Plater, 75 Bleecker st., New York.

Rawhide Sash Cord has no equal for heavy windows or dumb-waiters. Makes the very best round belting. Darrow M'f'g Co., Bristol, Ct."

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

For Fourneyron and Jonval Turbine Water Wheels, Mill-work, Shafting, Pulleys and Hangers, apply to J. Cornell & Co., Sandy Hill, N.Y.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Scientific American.—Back Nos., Vols., and Sets for sale. Address Theo. Tusch, City Agent, 37 Park Row, New York.

Pictures for the Sitting Room.—Prang's latest Chromos, "Flowers of Hope," and "Flowers of Memory." Sold in all Art and Book Stores throughout the world.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

Shop, Town, County, or State Rights for sale, for Patent Coal Scuttle. For circular, etc., address T. T. Markland, Jr., 1515 South st., Philadelphia, Pa.

Galvanized iron ventilating skylights, straight and curved extension lights, conservatories, etc., under patents dated 1869-70, are approved by every architect. For Rights address Geo. Hayes, 758 8th ave., New York.

Grindstones made by machinery, perfectly true, at reduced prices. Send ½oz. sample of grit wanted, by mail. J. E. Mitchell, 310 York avenue, Philadelphia.

L. L. Smith, 6 Howard st., N. Y., Nickel Plater. First Premium awarded at the late Fair of the American Institute. Licenses granted by the United Co., 17 Warren st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-tun propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

Stiff, heavy, powerful lathes, planers, shapers, slotters, and radial drills, in stock. E. & A. Betts, Wilmington, Del.

Second-hand donkey pumps, 12, 25, and 35-H. engines, leather hose, old style blowers, cocks, valves, etc., etc. Wm. D. Andrews & Bro., 414 Water st., New York.

Kitchen Grindstones, for sharpening table knives, Loring's pat., best article out. J. E. Mitchell, Agent, 310 York avenue, Philadelphia.

An experienced mechanical and railway engineer wishes a position as Master of Machinery, or Manager. Address "Engineer," Station "G," Philadelphia, Pa., Postoffice.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Cutlers' Grindstones, made by machinery. Wichersly, Newcastle, or Nova Scotia, at 8c. an inch. J. E. Mitchell, 301 York ave., Phil'a.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Caldwell's Dryer dries Brick, Fire Brick, Tile, Peat, Whiting, etc., as fast as made. J. K. Caldwell & Co., Philadelphia.

Harvester Grinders—Loring's patent—grinds automatically, and any boy can sharpen a cutter perfectly. J. E. Mitchell, 310 York ave., Philadelphia.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming 12 years in use. Beware of Imitations.

Notice to the Purchasers and Manufacturers of Ice Machines.

As the holder of Letters Patent from the United States, under date April 12, 1870, I hereby caution all parties manufacturing or purchasing Ice Machines, operated with Chimogene, against infringements of said Letters Patent. This public caution is specially intended for the notice of the Arctic Ice and Refrigerating Company, of the City of New York, and of parties who may contemplate the purchase from them of the Ice Machine at present manufactured by them, which clearly infringes my Letters Patent.

D. L. HOLDEN, P. O. Box 6049, New York city.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

R. R. S., of Va., and others.—We are receiving many inquiries upon the subject of cement for aquariums, not containing lead. Can anybody give us a good recipe of this kind? The following is highly recommended by a correspondent of the Boston *Journal of Chemistry*, but it contains the objectionable substance. Take 10 parts by measure of litharge, 10 parts of plaster of Paris, 10 parts of dry white sand, 1 part of finely powdered resin, and mix them, *when wanted for use*, into a pretty stiff putty with boiled linseed oil. This will stick to wood, stone, metal, or glass, and hardens under water. It ts also good for marine aquaria, as it resists the action of salt water. It is better not to use the tank until three days after it has been made.

C. A. L., of Tenn., finds that his bolting cloths (No. 9) recently clog on all occasions, with good wheat flour properly ground on best French burrs. The cloths have been in use about twelve months. He wishes to ascertain, if possible, a way to prevent this. He says he has to stop and brush them off very often, and attributes the mischief (we think correctly) to having ground a very damp lot of wheat, which he thinks soured on the bolting cloths. He is a miller of long experience and served a regular apprenticeship at the business, but knows of no way to remedy the evil complained of. If any of our correspondents can prescribe a remedy, we shall be glad to hear from them.

C. D. C., of W. Va.—There are various proportions for speculum metal for reflecting telescopes. We give you four. First: copper 64 parts, pure tin, 29 parts; melt separately with the use of black flux, and mix. Second: copper, 2 parts, pure tin, 1 part; mix as before. Third: copper, 64, tin 29 to 33 parts. Fourth: according to Lord Rosse, the constructor of the great reflecting telescope which bears his name, the best proportions are, copper, 1,264 parts, tin, 589 parts. Sometimes a little arsenic is added to increase the whiteness of the alloy. These alloys are very difficult to manipulate, as they are likely to crack in cooling.

W. A. B., of Mass.—We do not believe mere age hardens stereotype metal. We think it probable, however, that plates which have been used in the press for some time would be somewhat more dense and hard than those fresh from the mold. In the cold state, and remaining at rest, all the change that could occur would, in our opinion, be a slight oxidation of the surface. It is barely possible, however, that a slow crystallization may go on in such metal, under favoring circumstances, analogous to that which is known to take place in other metals; but we do not think this very probable.

D. D. S., of Ill.—You may bleach beeswax by exposing it for a sufficient time to the action of the air and light after cutting it into thin shavings. A quicker way is to melt the wax and add for each pound two ounces of nitrate of soda, and one ounce of sulphuric acid diluted with nine parts of water. The latter should be added very slowly, while the melted wax is constantly stirred with a glass rod. It is then cooled and set aside after filling the vessel with boiling water. Washing the wax with boiling water until no trace of the acid remains completes the process.

W. R. B., of Va.—The combustion of a lamp may be kept up in a close vessel by forcing oxygen into the vessel, and the carbonic acid gas, expanded by heat, might be used as motive power. There would, however, be serious practical difficulties in applying this principle to the propulsion of machinery. This correspondent writes that the mountains about Waynesboro, Va., abound in the black oxide of manganese.

D. R., of N. B.—It is not good practice to make the induction pipe to a steam cylinder too large, as you thereby increase the area of radiating surface. We therefore answer that it is not just as well to make these pipes larger than necessary. Such kind of loose practice in anything relating to steam is intolerable at the present day, when the whole subject is reduced to a science.

C. L. P., of La.—We believe the best paper-hangers' paste, as well as a paste for general purposes, is simply wheat or rye flour beaten into cold water to perfect smoothness, and the whole just brought to a boil, while being constantly stirred to prevent burning. A little creosote, or carbolic acid, will make it keep much better. Any addition to this paste fails to improve it.

White Brass.—We are in receipt of numerous inquiries as to where the white brass described on page 343, current volume, can be obtained. Parties interested in its sale would do well to advertise it. We cannot answer these inquiries, as we know of no one in this country or in Europe who sells the article. We gave in the article referred to all the information we are in possession of in regard to it.

W. S. H., of N. Y.—One hundred and thirty revolutions per minute is a very low speed for a steam engine with cylinders of nine inches diameter and twelve inch stroke. If properly constructed in all respects, no economy would result from the reduction of speed. Reduction of the speed would reduce the power of the engine.

F. A. C., of Mass.—The best way to keep rain water sweet in a cistern, is to first collect it in a tank, and filter it before receiving it into the cistern below the surface. This will remove the organic matters, and prevent fermentation. Care should also be taken to prevent surface drainage into it.

F. H., of N. Y.—Gold plate may have its color restored without polishing after annealing, by dipping it for a moment in a solution of cyanide of potassium, and then washing it thoroughly in water. Care should be taken not to touch the hands with the solution, as it is a deadly poison.

D. L., of Vt.—The extent to which expansion of steam may be carried by the lap of the valve alone, with convenience and economy, does not exceed a cut off at one third of the stroke. It is better to use a cut-off valve, actuated by a second eccentric, than to use lap beyond this limit.

J. McF., of Pa.—The soft material that you send looks as if it had some resemblance to bauxite, but we could not determine with certainty without making a careful chemical analysis; expense, $20. The other substance appears to be iron ore, perhaps of value.

L. M., of Mo.—The term regulus is an old name applied by the alchemists to metallic antimony, arsenic, cobalt, etc. Thus, regulus of antimony is metallic antimony, etc.

R. G. P., of Miss.—You will probably secure the business information you seek by a notice in our "Business and Personal" column.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

WOOD PAVEMENT.—John W. Brocklebank, New York city, and G. W. Tubbs, Elizabeth, N. J.—This invention relates to improvements in wood pavements of that kind wherein blocks arranged vertically in rows across the road bed, either with or without spaces between, to be filled with gravel, etc., are placed upon a superstructure intermediate between the graded road bed and the blocks, and it consists in an arrangement of the said blocks on a foundation of sills laid across the roadbed parallel with each other, on the graded surface, with spaces between filled with sharp sand, the said spaces being as wide as the thickness of the blocks which are set upon the sand; and they are supported at the edges, which are placed together in forming the continuous row, by short joists laid across the sills, the corners of the blocks being recessed for the purpose, each joist supporting two blocks.

MOWERS AND REAPERS.—Wm. Michael, Murrysville, Penn.—This invention relates to improvements in the driving mechanism for mowers and reapers, and consists, in an arrangement of the driving wheels on short, independent axles, concealed by adjusting screw caps, and gearing them with loose pinions on a counter shaft, having spring ratchet clutches, communicating the motion from both driving wheels together, or one independently of the other when moving in curved lines, so that one driving wheel goes faster than the other, the said clutches being held in gear by springs which allow them to slip out when the machine is backed.

PAPER BOXES.—John Root, New Haven, Conn.—This invention relates to improvement in securing the parts of paper boxes together where they lap each other, and consists in fastening them by metal clasps consisting of strips of thin sheet metal bent over the edges, and pressed together so as to clamp the parts between them.

SHADES FOR GAS LIGHT.—Wm. Fullager, Brooklyn, N. Y.—This invention relates to improvements in shades for gas lights, and consists in the combination with the ordinary conical porcelain or other shades, which shade the lights at the sides, of a bottom shade of porcelain arranged for the support of the conical shade, and calculated to shade that part of the light thrown down, and not shaded by the present shades. The said upward shade may also be used with lamps, with slight changes in adaptation to the bras rings or supports, and is applicable without change of the form represented, to what are known as the student lamps.

SUBMARINE DRILLING APPARATUS.—Samuel Lewis, Williamsburgh, N. Y.—This invention has for its object to furnish an improvment in the apparatus for raising the boat, or other floating platform, from which a gang of drills is operated, so that it may be unaffected by the rise and fall of the tide.

STEAM PUMPING ENGINES.—S. D. Gilson, Syracuse, N. Y.—This invention relates to a new and important improvement in engines for pumping and forcing water, more especially designed as a steam fire engine, but applicable to other purposes, and it consists in such a construction and arrangement of parts that the motion of a reciprocating engine is duplicated by a simple crank movement from the shaft of an oscillating piston.

APPARATUS FOR PACKING PRESERVES, ETC.—C. T. Provost, New York city.—The object of this invention is to facilitate the packing of tomatoes and other vegetables or fruit in the preserving cans. At present vegetables are packed so loosely that in many cases the value of the can exceeds by far that of its contents. By means of this invention the cans can be thoroughly and closely packed, and the useless water removed, without improperly mashing the fruit or vegetables to be preserved.

SKATE FASTENING.—Thomas Almond, Fitchburg, Mass.—This invention relates to a new device for clamping and securing skates to the soles and heels of boots or shoes. The invention consists in the use of adjustable toe clamps and of a heel jaw all pivoted directly to the skate runner, so that the latter can be secured to the boot or shoe, without the use of straps or projecting levers.

REIN HOLDER.—J. R. Achenbach, Saddle River, N. J.—This invention has for its object to furnish a simple and convenient device for holding the reins when the team is standing, which shall be simple in construction, easily attached to the wagon, and which will hold the reins securely, and at the same time in such a way that they may be instantly detached when required.

ELECTRIC DECOMPOSITION OF COPPER AND BRASS.—Wm. Henry Walenn, London, England.—This invention consists in improvements in the electric deposition of copper and brass upon iron and other substances, to be made with less battery power, with greater economy, and more solidly and perfectly than has hitherto been done.

HOT BLAST OVENS.—Job Froggett, Youngstown, Ohio.—This invention relates to improvements in hot blast ovens, and consists, first, in inclosing the air pipe connections in the oven together with the main parts thereof; second, in providing two or more pipes or sets of pipes for dividing the blast, to lessen the friction; and third, in arranging air flues through the hot blast oven with holes admitting air immediately or directly to the gas where it enters the oven, or to the combustion chamber of hot blast ovens using other fuel.

SHEET METAL SPOON, FORK, AND OTHER HANDLES.—H. C. Milligan, Brooklyn, N. Y.—This invention relates to improvements in the construction of the handles of spoons, forks, and other implements made of sheet metal, or handles only made of sheet metal, and consists in making them with oblique corrugations stamped into them on one side and raised on the other, between the edges which are left plane for a narrow space, the said corrugations being made for strengthening and ornamenting the handles, and in the case of spoons is designed to produce a sufficiently strong handle from the thinnest sheet metal of which the bowl may be made.

BARK MILL.—Lewis N. Hermance, Kingston, N. Y.—This invention relates to an important improvement in the ordinary bark mill, and has for its object to facilitate the adjustment of every mill to fine or coarse work, and to allow the runners to be raised when they should have become dull by wear, so that by being brought nearer to the grinders they may again be made useful.

SEWING MACHINE POWER.—John W. Jordan, Lexington, Va.—This invention relates to improvements in means for propelling sewing machines, and consists in an apparatus for imparting rotary motion to a driving shaft mounted together with the sewing machine on a rocking or swinging frame, either by the rocking or swinging of the said frame to which motion is imparted by the operators mounted on the said frame in a suitable seat.

MOTION POWER FOR CARRIAGES.—George Kilner and F. H. Simmons, Sullivan, Ill.—This invention relates to improvements in motive power apparatus for land carriages, and consists in a combination of foot treadles, crank shaft, pinion master, wheel pinions, and cog rims, applicable to the propulsion of all land carriages, whether for road use or agricultural purposes, and applicable also for drawing other machinery. The invention consists in improved steering apparatus for the carriages to be propelled by the said improved motive power.

WARMING INSOLE FOR BOOTS AND SHOES.—Philipp Martin Ernst, New York city.—This invention relates to a new straw insole for boots and shoes, which, on account of its being a bad conductor of heat, serves to keep the feet warm without preventing their ventilation.

WINDOW BLIND.—Thos. Donato, New York city.—This invention relates to a new manner of securing pivoted slats in the frames of window blinds. The invention has for its object to provide a more secure fastening for the slats, and, at the same time, greater facility for removing the same for repair.

THRASHING MACHINE.—John S. Fulton, Gallatin, N. Y.—This invention relates to a new thrashing machine, into which the straw is fed transversely, so that it will not in the least be injured or broken by the thrashing process.

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PRINTING PRESS.—William Anderson Kerr, Easton, Pa.—This invention relates to a new rotary press for printing both sides of one sheet by one process. The invention consists chiefly in the peculiar arrangement of the vertically reciprocating type frames which operate in conjunction with rotary platens, in such manner that they will be automatically inked during their reciprocating motion. The invention consists also in the arrangement of inking mechanism, whereby the ink is transferred from the lower part of each type frame to the type at the upper part of the same.

METAL ROOFING.—Seymour Hughes, Hudson City, N. J.—This invention has for its object to so construct the plates of a metallic roofing that the oints formed between them may be entirely water-tight.

FUSE COMPOSITION.—William H. Rogers, Brooklyn, N. Y.—This invention relates to a new and useful improvement in a composition for fuses for blasting and other purposes.

BOOK REPOSITORY.—Robert L. Dodge, Gallatin, Mo.—The object of this invention is to furnish means for supporting and preserving books, and rendering them accessible, and consists in arranging in a casing of suitable size a series of hinged frames, so constructed as to receive and support the books.

OSCILLATING ENGINE.—Henry Broomell, Christiana, Pa.—This invention relates to a new and useful improvement in the class of steam engines known as "oscillating engines," and consists in the peculiar manner of arranging the steam ports and regulating the motion of the engine.

TIDY PIN.—Hial H. Newton, Cleveland, Ohio.—This invention relates to a new and useful improvement in a devise for fastening tidies to upholstered furniture, for the protection of such furniture, and it consists in a pin with an elastic head, constructed with double prongs.

BABY CARRIAGES.—James Higgins, Salem Crossing, Ind.—This invention relates to a new and useful improvement in carriages for babies, whereby they are rendered much more useful and convenient than they have hitherto been, and it consists in combining rockers with the body of the carriage, and so constructing the carriage, otherwise, that the body may be readily removed, and a baby cradle formed of it.

FELLY SAW.—Geo. Steck, Hughesville, Pa.—This invention has for its object to saw out of plank, fellies or other pieces that require to be curved in the direction of their length, and, at the same time, to have straight sides.

COMBINED ABDOMINAL AND BACK SUPPORTER AND TRUSS.—R. J. Cundiff, Lynchburg, Va.—This invention consists in a variety of constructions and and arrangements of a hernia truss, back supporter, abdominal supporter, and elastic bar.

MECHANICAL MOVEMENT.—Nathaniel Bradford, Addison, Me.—This invention has for its object the proportioning of power to resistance, in such manner that, when resistance is small power may be reduced in order to the gaining of speed, and, when resistance is great, power may be increased by the sacrifice of speed.

NAIL HAMMER.—E. S. Morton, Plymouth, Mass.—This invention relates to a new and useful improvement in nail hammers, and consists in a slot formed at the base of the claws, and at about right angles therewith, by means of which a nail may be held in the hammer and started in the wood with one hand, thus rendering the hammer very convenient in driving nails in places where but one hand can be used.

CIRCUMFLEXOR.—Stephen R. Kirby, East Saginaw, Mich.—This invention relates to a new and useful improvement in an instrument for describing regular and irregular curves, for obtaining the profile or face of irregularly curved or undulating surfaces or curves, and straight lines combined, and consists in the combination of adjustable tressle-work with a flexible rod or ribbon, and in connection therewith, an adjustable straight-edge and connecting rod, by means of which a series of parallel irregular or regular curves, either with or without straight lines, may be described.

FENCE.—Benning Rowell, Byersville, N. Y.—This invention consists of panels, each composed of two parallel rails bearing a lattice work of slats; said panels being sustained at their ends by trusses having upper and lower cross bars for the support of the parallel rails; and said panels being connected at their ends by perpendicular rods passing through said rails, and between the cross bars of the trusses.

BAR FOR CASTING PIPES.—John Enright, Louisville, Ky.—This invention relates to a core bar, that may be made to collapse, after a pipe has been cast around it, in order that the bar may be readily withdrawn from within the pipe, and that may be expanded again to the required size previous to being inserted in the mold, whereby the use of hay, rope, or other elastic body, wound around the core, to be afterward burned, in order to permit the withdrawal of the core bar, is rendered unnecessary, and a metallic surface presented for the loam coating to be placed upon.

COTTON CARDING MACHINE.—Gilman Jaquith, Concord, Mass.—The object of this invention is to obviate some difficulties which are met with in carding cotton on ordinary machines, and improve them in various particulars, and consists in the means provided for cleaning the cotton from dirt and foreign substances.

LOCK.—John Gérard, Trenton, N. J.—This invention relates to improvements in mortise and rein locks, and consists in pivoting one end of the lever which works the latch bolt to an eccentric or cam, in a novel manner, by which the said end may be thrown back by raising the cam to let the other end move forward to allow the latch bolt to be drawn forward for reversing. It also consists in improvements in the construction of the tails or shanks of the latch and locking bolts whereby the size is reduced while maintaining the requisite strength, to economize in metal, and to insure better adhesion of the composition heads which are cast on the said tails, the said adhesion being more perfect when cast upon small rods, which do not cause the metal to "blow" as much as the larger ones do. The invention also consists in the application to the striking plate of a friction spring which presses against the lock plate when the door is shut, and prevents rattling.

DRAWING OFF TALLOW, LARD, ETC., FROM PRESSURE TANKS.—J. H. Archer, Beaumont, Texas.—This invention has for its object to furnish an improved method of drawing off tallow, lard, etc., from the rendering, or pressure tanks, by means of which the time and labor required for removing the tallow, lard, etc., will be greatly lessened; by which the tallow etc., will be all drawn from the tank, and will be free from dirt and water, thus requiring no manipulation to free it from water.

IRON TENDER FRAME.—Benjamin W. Healey, Providence, R. I.—This invention has for its object to furnish an improved iron tender frame, which shall be lighter, stronger, and more durable than the frames constructed in the ordinary manner.

COFFEE AND TEA STEEPER.—Joseph B. Wakeman and Alonzo M. Bush, Hancock, N. Y.—This invention has for its object to furnish an improved device for containing coffee or tea while being steeped, which shall be simple in construction, and more effective and satisfactory in operation than the steepers as heretofore made.

BALING PRESS.—E. J. Marsters, Shaw's Flat, Cal.—This invention has for its object to furnish a simple, convenient, and powerful baling press for cotton, hay, etc., and which shall be so constructed as to remove the necessity for the heavy side doors now required in presses.

COMBINED SOWER, PLANTER, CULTIVATOR, SCRAPER, AND GANG PLOW.—J. P. Eddleman, Pilot Point, Texas.—This invention has for its object to furnish a strong, simple, durable, and effective machine which shall be so constructed and arranged that it may be readily adjusted for use as a gang plow, seed sower, seed planter, cultivator, and cotton scraper, and which will do its work thoroughly and well in either capacity.

STUD NIPPERS.—Granville T. Shepley, West Groton, Mass.—This invention relates to a new and useful improvement in nippers or pliers for inserting studs in rubber or leather belting, and consists in forming indentations or channels in the face of each of the jaws of the nippers, which correspond with the end of the stud in shape and size, so arranged in the jaws that they correspond with each other when the jaws are closed.

TONGS.—Joshua J. Percival, Speedwell, Va.—This invention has for its object to overcome the deficiencies of tongs, which are produced by the lateral play of the shanks.

CIRCULAR SAW MILLS.—C. E. Grandy, Upton, Mass.—This invention has for its object to furnish an improved attachment for the frames of circular saw mills, in front of the saw, which shall be so constructed and arranged that while supporting the side of the log from which the board or other lumber is being cut, as it is being carried past it by the carriage, it may also serve as a set gage when setting up the log for another cut.

PORTABLE TOBACCO PRESS.—William S. Ford, Evansville, Ind.—This invention has for its object to furnish a simple, strong, and convenient press, designed especially for pressing leaf tobacco, into the hogsheads, and which shall be so constructed that the entire strain may be borne by the tobacco being pressed.

CARRIAGE AXLES.—Lomax Littlejohn, New York city.—This invention has for its object to improve the construction of carriage axles so as to obtain a longer bearing surface without lengthening the axle, or to obtain an equal bearing surface and at the same time shorten the axle.

RAILROAD CAR STOVE.—Adolph Brase and Lemuel Salladey, Sciotoville, Ohio.—This invention has for its object to furnish an improved stove which shall be so constructed that should the said stove be overturned, by the overturning of the car in which it may have been placed, the fire will be prevented from escaping through the stove pipe hole, and the danger of the car's being set on fire will be removed.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING June 7, 1870.

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103,820.—REIN HOLDER.—John R. Achenbach, Saddle River, N. J.

103,821.—CONSTRUCTION OF HORSE POWER FOR COTTON GINS, ETC.—J. M. Albertson, New London, Conn. Antedated May 30, 1870.

103,822.—SKATE FASTENING.—Thomas Almond, Fitchburg, Mass.

103,823.—DRAWING OFF TALLOW, LARD, ETC., FROM RENDERING TANKS.—J. H. Archer, Beaumont, Texas.

103,824.—CONDENSER FOR THE MANUFACTURE OF COAL GAS.—Avery Babbett and W. W. Binny, Auburn, N. Y.

103,825.—ORE SEPARATOR.—Hosea Ball, New York city.

103,826.—LETTER BOX.—C. R. Bancroft (assignor to C. C. Dickerman and C. W. Munroe), Boston, Mass.

103,827.—REMOVABLE CALK FOR HORSESHOES.—J. D. Barnum, Amenia Union, N. Y.

103,828.—LANTERN FOR STREETS.—Joseph W. Bartlett, New York city.

103,829.—TYPE CABINET.—Chauncey Bassett, Kewanee, Ill.

103,830.—MACHINE FOR PARING FRUIT AND VEGETABLES.—A. G. Batchelder, Lowell, Mass.

103,831.—APPARATUS FOR LIGHTING GAS BY ELECTRICITY.—W. W. Bachelder, Boston, Mass.

103,832.—THRASHING MACHINE.—David C. Baughman, Tiffin, Ohio.

103,833.—MILL BOLT.—W. H. Berdan, Mooreville, Mich.

103,834.—DERRICK FOR HOISTING CRANE.—H. S. Blood, New Orleans, La.

103,835.—POST FOR PEGGING-JACK—Daniel Bowker, Boston, Mass.

103,836.—PNEUMATIC GAS MACHINE.—David Boyle, San Francisco, Cal.

103,837.—DOOR KEY.—James Brady (assignor to the Branford Lock Works), Branford, Conn.

103,838.—LOCK.—James Brady (assignor to the Branford Lock Works Branford, Conn.

103,839.—STOVE.—Adolph Brase and Lemuel Salladey, Sciotoville, Ohio.

103,840.—VALVE MECHANISM FOR OSCILLATING ENGINE.—Henry Broomell, Christiana, Pa.

103,841.—BOLTING DEVICE FOR SAFES.—S. J. Burton, Charlestown, assignor to American Steam Fire-Proof-Safe Company, Boston, Mass.

103,842.—REFRIGERATOR.—James C. Campbell, New York city.

103,843.—SAWING MACHINE.—James Chase, Rochester, N. Y. Antedated May, 23, 1870.

103,844.—HAY-LOADING DEVICE.—A. B. Clark, Grass Lake, Mich.

103,845.—CASK-FILLER.—David Cope, Liverpool, England.

103,846.—BUGGY-TOP BED.—A. M. Cory, New Providence, N. J.

103,847.—MECHANICAL MOVEMENT FOR SEWING MACHINES, ETC.—Edwin Cowles, Cleveland, Ohio.

103,848.—MACHINE FOR TRIMMING BLIND RODS.—B. C. Davis, Binghamton, N. Y.

103,849.—ROSETTE.—J. W. Dayton, (assignor to the American Suspender Company), Waterbury, Conn.

103,850.—CAR COUPLING.—Thomas W. Defrees, South Bend, Ind.

103,851.—SAW SET.—J. T. Dickey, Farmington, Ill.

103,852.—MANUFACTURE OF GLUE.—Andrew Dietz, New York city.

103,853.—BOOK REPOSITORY.—Robert L. Dodge, Gallatin, Mo.

103,854.—WINDOW BLIND.—Thomas Donato, New York city.

103,855.—COMBINED SOWER, PLANTER, CULTIVATOR, SCRAPER, AND GANG PLOW.—J. P. Eddleman, Pilot Point, Texas.

103,856.—VENTILATOR OR COWL.—Jacob Edson, Boston, Mass.

103,857.—INSOLE FOR BOOTS AND SHOES.—P. M. Ernst (assignor to himself and Ernst Schmidt), New York city.

103,858.—SPINNING MACHINE.—L. W. Felt, Keene, N. H.

103,859.—DOOR SPRING.—J. T. Folwell, Camden, N. J.

103,860.—PORTABLE TOBACCO PRESS.—W. S. Ford, Evansville, Ind.

103,861.—MACHINE FOR BINDING GRAIN.—Thaddeus Fowler, Tottensville, N. Y.

103,862.—METHOD OF BINDING GRAIN.—Thaddeus Fowler, Tottensville, N. Y.

103,863.—COVER FOR SEWING MACHINE.—E. F. French, New York city.

103,864.—UMBRELLA RIB.—Henry S. Frost (assignor to himself, A. G. Davis, and A. N. Woolson), Watertown, Conn.

103,865.—SHADE FOR GASLIGHT.—Wm. Fullagar, Brooklyn, N. Y.

103,866.—THRASHING MACHINE.—John S. Fulton, Gallatin, N. Y.

103,867.—ATTACHING HANDLES TO CUTLERY.—J. W. Gardner, Shelburne Falls, Mass.

103,868.—LOCK.—John Gerard, Trenton, N. J.

103,969.—ROTARY ENGINE.—Samuel D. Gilson, Syracuse, N. Y.

103,870.—BOILER.—Myron Gore, Batavia, Ill.

103,871.—HEAD BLOCK FOR SAW-MILL.—C. E. Grandy, Upton, assignor to S. Heald & Sons, Barre, Mass.

103,872.—CHECK VALVE.—Darwin Alanson Greene, New York city.

103,873.—PRUNING KNIFE.—Manasseh Grover, Clyde, Ohio.

103,874.—STREET RAILWAY CAR.—J. J. Gutierrez, Jefferson Parish, La.

103,875.—ELECTRO-MAGNETIC SIGNAL APPARATUS FOR RAILROADS.—T. S. Hall, Stamford, assignor to Hall's Electric Railway-Switch and Draw-Bridge Signal Company, New Haven, Conn.

103,876.—COMPOUND TROCHE OR BUCHU.—H. J. Hamilton Brooklyn, N. Y.

103,877.—COTTON SCRAPER OR CULTIVATOR.—T. J. Harris Guntown, Miss.

103,878.—IRON TENDER-FRAME.—B. W. Healey, Providence, R. I.

103,879.—PROCESS FOR MAKING MOLDS FOR CASTINGS OF ALTO-RELIEVO FIGURES, ETC.—Nicholas Heintzelman, New York city Antedated May 24, 1870.

103,880.—LOOM.—John J. Herbert, Philadelphia, Pa.

103,881.—BARK MILL.—L. N. Hermance, Kingston, N. Y.

103,882.—BABY CARRIAGE.—James Higgins, Salem Crossing, Ind., assignor to himself and W. S. Medaras.

103,883.—STEAM RAM.—Thomas Hill, Vallejo, Cal.

103,884.—HEATING STOVE.—Robert Hillson, Albany, N. Y.

103,885.—LAMP SHADE SUPPORTER.—E. W. Holt, Corinna, Me.

103,886.—RAILWAY CAR BRAKE.—Thomas Hopper, Hatfield Hopper, and Chandler C. Coats, Newark, N. J.

103,887.—METAL ROOFING.—Seymour Hughes, Hudson City N. J.

108,888.—PATTERN FOR CASTINGS.—J. L. Jackson, New York city.

103,889.—CARDING MACHINE.—Gilman Jaquith, Concord, Mass.

103,890.—CUTTER FOR WOOD-MOLDING MACHINES.—Dedrick Jordan, Charlestown, Mass., assignor to A. S. and J. Gear & Co., New Haven, Conn.

103,891.—MOTIVE MECHANISM FOR SEWING MACHINES.—J W. Jordan, Lexington, Va.

103,892.—SAWING MACHINE.—Jacob Kauffmann, Gilboa, Ohio.

103,893.—PRESSURE-GAGE AND SAFETY VALVE.—A. A. Kent, Lyons, Iowa.

103,894.—PRINTING PRESS.—William Anderson Kerr, Easton, Pa.

103,895.—MOTIVE MECHANISM FOR CARRIAGES.—George Ellner and F. H. Simmons, Sullivan, Ill.

103,896.—ADJUSTABLE CURVE FOR USE OF DRAFTSMEN.—S. R. Kirby, East Saginaw, Mich.

103,897.—STREET-CAR STARTER.—Benjamin Lepper, St. Louis, Mo.

103,898.—CHURN.—J. S. Lewis, Elkport, Iowa.

103,899.—SUBMARINE DRILLING APPARATUS—Samuel Lewis, Williamsburg, N. Y.

103,900.—CARRIAGE AXLE.—Lomax Littlejohn, New York city.

103,901.—PACKING FOR ROTARY ENGINE.—John Loader (assignor to himself, W. H. Child, and A. W. C. Williams), London, Eng.

103,902.—STEAM GENERATOR.—John Loader and Wm. H. Child (assignors for one third their right to A. W. C. Williams), London England.

103,903.—FENCE.—L. E. Lockling, Perrysburg, and N. N Whitaker, Sheridan, N. Y.

103,904.—VARIABLE CUT-OFF VALVE GEAR.—G. E. Long Harrisburg, Pa.

103,905.—LOCOMOTIVE HEAD LIGHT.—Roger W. Love, Windsor, Vt.

103,906.—HAND SPINNING MACHINE.—Wm. H. Main, Marietta, Wis.

103,907.—BALING PRESS.—Enoch J. Marsters, Shaw's Flat Cal.

103,908.—CHURN.—H. B. McFall, Mount Solon, Va.

103,909.—PASTE FOR POLISHING METALS.—Peter McManus and G. W. Latimer, Detroit, Mich.

103,910.—CLUTCH MECHANISM FOR HARVESTER.—William Michael, Murrysville, Pa.

103,911.—IRON BRIDGE.—Mahlon Miller, Cleveland, Ohio.

103,912.—MACHINE FOR CUTTING OUT GRINDSTONES.—J. E. Mitchell, Philadelphia, Pa.

103,913.—FUEL PRESS.—T. M. Mitchell, Philadelphia, Pa.

103,914.—NAIL HAMMER.—Ephraim S. Morton, Plymouth, Mass.

103,915.—TIDY PIN.—H. H. Newton, Cleveland, Ohio.

103,916.—DOOR MAT.—A. P. Noyes, Middletown, assignor to J. S. Andrews, Chelsea, Mass.

103,917.—LAMP GAS BURNER.—Rufus Nutting, Randolph, Vt.

103,918.—CULTIVATOR.—Henry W. Ostrom, Grand Rapids, Mich.

103,919.—BRAND FOR CANCELING STAMPS.—Amos D. Owen, Thorntown, Ind.

103,920.—FIRE TONGS.—J. J. Percival, Speedwell, Va.

103,921.—METALLIC BOOT AND SHOE HEEL.—A. T. Perrine, Louisville, Ky.

103,922.—GRAIN CLEANER.—Chauncey Perry, Rochester, N.Y. Antedated May 23, 1870.

103,923.—HOT-BLAST APPARATUS.—Jonas J. Pierce, Sharpsville, Pa.

103,924.—PRINTING TELEGRAPH INSTRUMENT.—F. L. Pope, Elizabeth, N. J., and T. A. Edison, New York city.

103,925.—SAWSET.—H. K. Porter, Boston, Mass.

103,926.—CALIPER.—H. K. Porter, Boston, Mass.

103,927.—APPARATUS FOR PACKING PRESERVES.—C. T. Provost, New York city.

103,928.—LAMP SHADE.—Wm. Reed, Jr., Boston, Mass, assignor to himself and Wm. Reed, M.D.

103,929.—GAS RETORT.—James Rigby and P. A. Palmer, Marietta, Ohio.

103,930.—COTTON SCRAPER.—D.G. Rittenhouse, Shelby Depot, Tenn.

103,931.—FUSE COMPOSITION.—William H. Rogers, Brooklyn, N. Y.

103,932.—PAPER BOX.—John Root (assignor to himself and Andrew Martin), New Haven, Conn.

103,933.—MILK-CAN HANDLE.—H. W. Shepard, Mannsville, N. Y.

103,934.—STUD NIPPER.—Granville T. Shepley, West Groton, Mass.

103,935.—COMBINED FEED AND WATER TROUGH.—Joseph Sherman, Coopersville, Mich., assignor to himself and William Sherman.

103,936.—CORN DROPPER.—J. L. Smith, Pemberton, N. J.

103,937.—VALVE.—August Snyder (assignor to Atwood & McCaffrey), Pittsburgh, Pa.

103,938.—SASH FASTENING.—Wm. B. Snyder and Robert Hubbard, Bridgeport, Conn.

103,939.—GEARING FOR CARPET-SWEEPING MACHINES.—G.F Tayler, New York city.

103,940.—APPARATUS FOR SPLITTING ROCK.—Eber Thayer, Union City, Mich.

103,941.—CORN SHELLER.—Ambrose B. Thompson, Owego N. Y.

103,942.—MOLD-BOARD PRESS.—Andrew Thompson, Ottawa Ill.

103,943.—STOVEPIPE VENTILATOR.—D.V.Thrift, Monroe, Iowa assignor for one half to Levi Fisher.

103,944.—VOLUTE SPRING.—Joseph Trent, Millerton, N. Y Antedated June 1, 1870.

103,945.—WASHING MACHINE.—David Vogt, Trenton, Mich.

103,946.—COFFEE AND TEA STEEPER.—J. B. Wakeman and A. M. Bush, Hancock, N. Y.

103,947.—ELECTRO-DEPOSITION OF COPPER AND BRASS ON IRON AND STEEL.—W. H. Walenn, London, England. Patented in England Dec. 24, 1868.

103,948.—CONCEALED HINGE FOR LANDAU CARRIAGE.—Edward Wells, New Haven, Conn.

103,949.—THREAD CONTROLLER FOR SEWING MACHINES.—Washington Wendell, Milwaukee, Wis., assignor to the Finkle & Lyon Manufacturing Co., Middletown, Conn.

103,950.—BOOTS AND SHOES.—Levi H. Whitney, Washington, D.C.

103,951.—FIRE-KINDLING FAGOTS.—W. J. Wiggins and Chas. Stout, St. Louis, Mo.

103,952.—SAW MILL.—W. M. Wilkin, Detroit, Mich.

103,953.—LIME BARREL OR KIBBLE.—F. K. Winsor, Hillsdale, Mich.

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103,954.—MACHINE FOR MAKING OXSHOES.—A. L. Wooding, Bristol, Conn.
103,955.—APPARATUS FOR COOLING ALE, BEER, ETC.—F. Zeitz, Philadelphia, Pa.
103,956.—MANGER.—C. E. Albright, Muncy, Pa.
103,957.—VELOCIPEDE.—A. M. Allen, New York city.
103,958.—SIDEBOARD AND EXTENSION TABLE.—Derk Arnaud, Boston, Mass.
103,959.—WASHING MACHINE.—Frank M. Bacon, Plainfield, N. J.
103,960.—PUMP.—B. C. Bailey, Constitution, Ohio.
103,961.—PRINTING PRESS. — Amos H. Bangle, Brooklyn, Cal.
103,962.—CANDY MACHINE.—Jesse S. Batchelder, Fort Wayne, Ind.
103,963.—FIRE-PROOF CEILING.—F. Bauman and G. F. Letz, Chicago, Ill.
103,964.—FLOUR SIFTER. — Peter Becker, Mount Vernon, N. Y.
103,965.—COPY BOOK.—N. P. Beers, New York city.
103,966.—PATTERN FOR MOLDING STOVE PLATES.—R. W. Belson, Philadelphia, Pa.
103,967.—LAMP BURNER.—George Berkstresser (assignor to himself, F. W. Irvine, Jacob Reed, and R. W. Berkstresser), Bedford, Pa.
103,968.—MANUFACTURE OF WOOD PAPER STOCK.—Geo. H. Bliss and Martin Rees, West Stockbridge, Mass.
103,969.—REEL FOR HARVESTER.—J. W. Bope, South Bend, Ind., assignor to himself and C. Aultman, Canton, Ohio.
103,970.—REST FOR HARVESTER.—J. W. Bope, South Bend, Ind., assignor to himself and C. Aultman, Canton, Ohio.
103,971.—MECHANICAL MOVEMENT.—Nathaniel Bradford, Addison, Me.
103,972.—WATER WHEEL.—Wm. Braidwood and H. J. Hewitt, New York city.
103,973.—CHAIR SEAT.—W. G. Bulgin, Vienna, N. J.
103,974.—COMPOUND FOR PREVENTING AND REMOVING INCRUSTATION IN STEAM BOILERS.—William H. Burridge, Cleveland, Ohio, assignor to A. L. Kingman, C. G. Dodge, and H. C. Hartwell.
103,975.—TOOL HOLDER.—R. P. Buttles, Mansfield, Pa.
103,976.—COMBINED LIQUID GAGE AND HYDROMETER.—S. R. P. Camp, New York city.
103,977.—COMPUTING SPRING BALANCE.—S. R. P. Camp, New York city.
103,978.—BEEHIVE.—H. F. Carpenter, Greencastle, Pa.
103,979.—WOOD PAVEMENT.—Louis A. Cauvet, New York city.
103,980.—TOILET MIRROR.—G. H. Chinnock, New York city, and E. P. Williams, Elizabeth, N. J.
103,981.—COTTON GIN.—J. M. Clough, Ilion, N. Y.
103,982.—PLOW.—H. C. Cloyd, West Alexandria, Ohio.
103,983.—CHILL BOSH FOR BOILING AND PUDDLING FURNACES.—Thos. Coates, Ironton, Ohio.
103,984.—SEWING MACHINE.—J. J. Cobb, Boston, Mass.
103,985.—CARRIAGE CURTAIN BUTTON.—Alonzo Comstock and J. H. Nicholson, Chicopee, Mass.
103,986.—ELECTRICAL COTTON-PICKING MACHINE. — R. F. Cooke, Brooklyn, N. Y.
103,987.—QUILTING FRAME.—John A. Cookerly, Frederick, Md.
103,988.—METALLIC CAP AND NOZZLE.—Edward T. Covell, Brooklyn, N. Y.
103,989.—LIQUID METER.—Robert Creuzbaur, Brooklyn, E.D., N. Y.
103,990.—LIQUID METER.—Robert Creuzbaur, Brooklyn, E.D., N. Y.
103,991.—PENMAN'S WRIST SUPPORTER.—Henry F. Cristy, Charlestown, Mass.
103,992.—COMBINED ABDOMINAL AND BACK SUPPORTER AND TRUSS.—R. J. Cundiff, Lynchburg, Va.
103,993.—WICK ADJUSTER FOR ARGAND LAMP BURNER.—W. B. Curtiss, Bridgeport, Conn.
103,994.—APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.—John Dailey, St. Louis, Mo.
103,995.—SPOOLING MACHINE.—G. W. Daugherty, Wilmington, Del.
103,996.—SPINDLE FOR SPINNING MACHINE.—George W. Daugherty, Wilmington, Del.
103,997.—LAUNDRY IRON HEATER.—Robert Diven, New York city.
103,998.—COMBINED ROASTER AND BROILER.—Thos. Drake, Cincinnati, Ohio.
103,999.—MANUFACTURE OF FROSTED PLUSH, PAPER, ETC.—H. V. Edmond, Norwich, Conn.
104,000.—HORSE COLLAR.—Joseph Englaender (assignor to self and Eugene Lungstras), Sedalia, Mo.
104,001.—DOVETAILING MACHINE.—H. H. Evarts, Chicago, Ill.
104,002.—PAPER FILE.—Thomas C. Fahnestock, Cincinnati, Ohio.
104,003.—STUMP EXTRACTOR.—Enoch Farnsworth, Sabbath Rest, Pa.
104,004.—TAILING ELEVATOR FOR SEPARATORS.—Arthur B. Farquhar, York, Pa.
104,005.—WAGON AXLE.—C. W. Fillmore, Marengo, and T. M. Jones, Chicago, Ill.
104,006.—COLORING AND DRYING PAPER.—C. C. Fitzgerald, New York city.
104,007.—TREATING MARBLE TO PRESERVE IT.—C. C. Fitzgerald (assignor to the Fletcher Marble Co.), New York city.
104,008.—PRODUCING MOSAICS UPON MARBLE.—C. C. Fitzgerald (assignor to the Fletcher Marble Co.), New York city.
104,009.—VAPOR BURNER.—David R. Fletcher, Covington, Ky.
104,010.—TEA AND COFFEE SERVICE.—Ira Yeamans, Brooklyn, N. Y.
104,011.—BEEHIVE.—Thomas H. Foster, Indianapolis, Ind.
104,012.—HYDRANT.—Jacob Fricker and Americus Warden, Cincinnati, Ohio.
104,013.—EYELET.—Thomas Garrick, Providence, R. I.
104,014.—SETTING-UP AND TENSION COMBS FOR KNITTING MACHINES.—William Gaskill, Cincinnati, Ohio.
104,015.—THILL COUPLING.—John H. Gee, Cortland, N. Y., assignor to G. T. Chapman, New York city.
104,016.—FRUIT BOX.—L. L. Gilliland, Dayton, Ohio.
104,017.—EMBROIDERING ATTACHMENT FOR SEWING MACHINES.—H. C. Goodrich, Chicago, Ill.
104,018.—ENVELOPE OPENER.—John P. Gruger (assignor to himself and Frederick Rodrigo), Philadelphia, Pa. Antedated May 27, 1870.
104,019.—WATER-SUPPLYING APPARATUS.—John C. Hagan, Nashville, Tenn.
104,020.—SPINDLE FOR SAFE LOCK.—Robert Haile (assignor to Charles Diebold and Jacob Kienzle), Cincinnati, Ohio.
104,021.—COOKING STOVE.—William Hailes, Albany, N. Y.
104,022.—CORSET SPRING.—Joseph Hanauer and N. Sartor, New York city.
104,023.—HARNESS SADDLE.—Emery E. Hardy, Joliet, Ill.
104,024.—RAILWAY CAR COUPLING.—Daniel Hart (assignor to himself and Jesse Yerks), Romulus, N. Y.
104,025.—FAUCET.—Irus W. Harvey, Norwich, Conn.
104,026.—WATER WHEEL.—William Haslup, Sidney, Ohio.
104,027.—RUBBER DOOR SPRING.—Joel B. Hayden, Schaghticoke, N. Y.
104,028.—HAND SEED PLANTER.—John Heberling, Mount Pleasant, Ohio.
104,029.—MACHINE FOR SHIRRING FABRICS.—Ansel Hecht, New York city
104,030.—SETTER, GAGE, AND CASE FOR SEWING MACHINE NEEDLES.—Eli E. Hendrick, Carbondale, Pa.
104,031.—ANIMAL TRAP.—N. F. Hersh, Round Hill, assignor to himself and A. B. Lerew, York Sulphur Springs, Pa.
104,032.—SPRING CLOSING CAP FOR OIL CUPS AND INKSTANDS.—H. H. Heskett, Le Roy, Ill.
104,033.—NUT LOCK.—Daniel Hoffman, Noblestown, and W. Johnston, Havelock, Pa.
104,034.—MANUFACTURE OF A NON-HYGROSCOPIC PULVERULENT ACID PHOSPHATE.—E. N. Horsford, Cambridge, Mass.
104,035.—HORSE COLLAR.—Wm. Kayes (assignor to himself, Charles Irving, and J. B. Forsyth), Boston, Mass.
104,036.—TRUSS FRAME BRIDGE.—Chas. Kellogg, Athens, Pa.
104,037.—GLOBE VALVE.—Norman King (assignor to himself and Daniel Homire), Etna, Pa.
104,038.—SEAL LOCK.—G. L. Kitson, Joshua F. Laning, and Joseph Bennor, Philadelphia, Pa., assignors for one half their right to C. A. Wolborn.
104,039—JOINTED SPRING GUARD.—U. B. Kline, Reamstown, Pa. Antedated June 3, 1870.
104,040.—METHOD OF FORMING CARRIAGE STEP.—Wilson W. Knowles, Plantsville, Conn.
104,041.—MOVABLE STORE SHELVING.—George Koch and Wm. Koch, Franklin, Pa.
104,042.—CULTIVATING HOOK.—J. Fred. Leitch, Oxford, N. Y.
104,043.—LETTER BOX.—E. T. Marsh, Rochester, N. Y.
104,044.—ADJUSTABLE HANGER FOR SHAFTING.—Volney W. Mason, Providence, R. I. Antedated May 30, 1870.
104,045.—THILL COUPLING.—H. Z. Mast, Fork Meeting House, Md.
104,046.—SOCKET PIPE MACHINERY.—F. M. Mattice, Cleveland, Ohio.
104,047.—RULING MACHINE. — John McAdams, Brooklyn, N. Y.
104,048.—SPRING BED BOTTOM.—Wm. McArthur (assignor to himself and J. A. Smith, Philadelphia, Pa.
104,049.—MEAT CHOPPER.—Arthur McCarter, Salem, Ohio.
104,050.—FAUCET.—William McKay, Newburyport, Mass., assignor to himself and C. E. Bayley.
104,051.—HANDLE OF SHEET METAL SPOONS, FORKS, ETC.—H. C. Milligan, Brooklyn, N. Y.
104,052. — TUBING AND FILTERING ARRANGEMENT FOR WELLS.—M. C. Monson, Chicago, Ill.
104,053.—CAR WHEEL.—H. W. Moore, Jersey City, N. J.
104,054.—PHOTOGRAPHIC PLATE HOLDER.—John W. Moore, Bellefonte, Pa.
104,055.—MACHINE FOR CUTTING AND DRESSING STONE.—Archibald Munro, Arbroath, and Wm. B. Adamson, Glasgow, North Britain.
104,056.—MANUFACTURE OF RUBBER-COATED CARRIAGE TRIMMINGS.—John W. Munson, Bridgeport, Conn.
104,057.—RAILWAY RAIL CHAIR AND JOINT.—John M. Orr Leesburg, Va.
104,058.—MACHINE FOR UNTWISTING AND SEPARATING HAIR ROPE.—Joseph Paradis and W. H. Drew, Brooklyn, N. Y.
104,059.—FARE RECORDER FOR CARS, ETC.—O. S. Peas, Xenia, Ohio.
104,060.—ORGAN BELLOWS.—Joseph R. Perry, Wilkesbarre, Pa.
104,061.—TOOL FOR CUTTING OFF BOLTS, RODS, ETC.—Henry Peters, Davenport, Iowa.
104,062.—MACHINE FOR PITCHING LAGER BEER AND OTHER CASKS.—Henry Rattermann, Cincinnati, Ohio.
104,063.—LATHE CHUCK.—John Rich, Painesville, Ohio.
104,064.—DOOR HANGER.—Samuel P. Robinson, Canterbury, Conn.
104,065.—FENCE.—Benning Rowell, Byersville, N. Y.
104,065.—SCREW COLLAR FOR LAMPS.—Wm. H. Russell, Brooklyn, N. Y.
104,067.—HARVESTER.—Jacob Seibel, Manlius, Ill.
104,068.—HEAD BLOCK FOR SAW MILLS.—George Selden and H. O. Kelsey, Erie, Pa., assignors to George Selden.
104,069.—BENCH HOOK.—H. J. Skinner, Dunkirk, N. Y.
104,070.—GRATE AND BACK FOR COOKING STOVES.—Jas. B. Slusser and W. H. Meech, Roanoke, Ind.
104,071.—GRATER.—J. M. Smith, Seymour, Conn.
104,072.—MACHINE FOR CLEANING CAST-IRON PIPE.—Wm. Smith, Alleghany City, Pa.
104,073.—ALARM FOR SAFES.—William Spear, Cape Elizabeth, Me.
104,074.—SAW FOR SAWING FELLIES.—Geo. Steck, Hughesville, Pa.
104,075.—BROILER.—William C. Stiver and John S. Williams, Brooklyn, N. Y.
104,076.—GAGE ATTACHMENT FOR TINSMITHS' SHEARS.—Orson W. Stow, Plantsville, Conn.
104,077.—SAWING MACHINE.—Jacob Strausbaugh, Jr., Tiffin, Ohio.
104,078.—BLOW PIPES.—J. R. Streett (assignor to James Vermillion), Washington, D. C.
104,079.—SAWING MACHINE.—Monroe Sweney, Warren, Ohio.
104,080.—COMBINED CRANK WRIST FOR HARVESTING MACHINES.—J. Oscar Taber, Salem, Ohio.
104,081.—SCAFFOLD BRACKET.—Joseph M. Taylor, Dublin, Ind.
104,082.—BEDSTEAD FASTENING.—John C. Turner, Newark, N. J.
104,083.—BAKER'S OVEN.—Joseph Vale and Charles L. Vale, Chicago, Ill.
104,084.—HEATING STOVE.—Nicholas S. Vedder, Troy, N. Y.
104,085.—MACHINE FOR HUSKING CORN.—Ralph Warriner, J. H. Baker, and G. B. Slocum, Saratoga Springs, N. Y.
104,086.—BRIDGE GATE.—Hubert Wermerskirchen, Chicago, Ill.
104,087.—CANE GUN.—William H. Werner, Nazareth, Pa.
104,088.—SEED PLANTER.—John E. White, Clinton, Ill.
104,089.—EARTH URINAL.—John G. White, Cambridge, Mass.
104,090.—REVOLVING STEAM GAGE COCK.—Daniel Williams and Edward Joseph, Gallipolis, Ohio.
104,091.—MANUFACTURE OF IRON.—John De Witt Williams (assignor to himself and John W. Butler), Philadelphia, Pa.
104,092.—DUSTING BRUSH.—Loren R. Witherell and Amasa B. Crandall, Galesburg, Ill.
104,093.—MACHINERY FOR MOVING COAL OR OTHER MINERALS.—John E. Wootten, Reading, Pa.
104,094.—CONDITION POWDER FOR HORSES AND CATTLE.—John H. Woolrich, Woburn, Mass.

REISSUES.

4,010.—Division A.—APPARATUS FOR EVAPORATING THE MOISTURE FROM ANIMAL AND VEGETABLE SUBSTANCES.—Charles Alden, Newburgh, for himself and Alden Fruit-Preserving Company, New York city, assignees of Charles Alden.—Patent No. 100,835, dated March 15, 1870.
4,011.—Division B.—PROCESS FOR EVAPORATING THE MOISTURE FROM ANIMAL AND VEGETABLE SUBSTANCES.—Charles Alden, Newburgh, for himself and Alden Fruit-Preserving Company, New York city, assignees of Charles Alden.—Patent No. 100,835, dated March 15, 1870.
4,012.—Division A.—FIRE ALARM SIGNAL AND APPARATUS.—Alexander Allen, Rochester, N. Y.—Patent No. 90,806, dated June 1, 1869.
4,013.—Division B.—FIRE ALARM SIGNAL AND APPARATUS.—Alexander Allen, Rochester, N. Y.—Patent No. 90,806, dated June 1, 1869.
4,014.—TAPS FOR OIL VESSELS.—Matthew Andrew, Melbourne, Australia.—Patent No. 94,059, dated August 24, 1869.
4,015.—PISTON ROD ADJUSTER.—Douglas Bly, Shambourg, Pa.—Patent No. 78,045, dated May 19, 1868.
4,016.—SLEEVE BUTTON AND STUD.—Barnes Clayton, Philadelphia, Pa.—Patent No. 62,008, dated February 12, 1867; antedated February 2, 1867.
4,017.—Division B.—PITMAN CONNECTION FOR HARVESTER.—J. W. Doty, Lockport, N. Y.—Patent No. 59,192, dated October 30, 1866.
4,018.—LOCK.—Hall's Safe and Lock Company, Cincinnati, Ohio, assignee of Joseph L. Hall.—Patent No. 38,384, dated May 5, 1863.
4,019.—CURTAIN KNOB.—Calvin Z. Kroh, Tiffin, Ohio.—Patent No. 49,634, dated August 29, 1865.
4,020.—DEODORIZING PETROLEUM.—Thomas Restieaux, Boston, Mass.—Patent No. 63,749, dated April 9, 1867.
4,021.—DEVICE FOR SHEARING AND CLIPPING HORSES AND OTHER ANIMALS.—Roswell T. Smith, William Earl, Joseph K. Priest, and John G. Blunt, Nashua, N. H., assignees of Roswell T. Smith and Joseph K. Priest.—Patent No. 72,103, dated December 10, 1867.
4,022.—FAUCET.—Edward A. Sterry, Norwich, Conn.—Patent No. 13,047, dated June 12, 1855; extended seven years.
4,023.—DYE FOR COLORING WOOL AND OTHER FIBROUS MATERIAL.—Albert Knight and George W. Talbot, Providence, R. I., assignees of George W. Talbot.—Patent No. 99,496, dated February 1, 1870.
4,024.—LINING FOR FIREPLACE.—Charles Truesdale and Wm. Resor & Co., Cincinnati, Ohio, assignees of Charles Truesdale.—Patent No. 91,689, dated June 22, 1869.

DESIGNS.

4,095.—SEAL OR BANNER.—Fred Walton Bacon, New Haven, Conn.
4,096.—SPOON.—Bennet Jerald (assignor to Charles Parker), Meriden, Conn.
4,097 to 4,100.—DOOR KNOB.—Ludwig Kreuzinger, Cambridge, assignor to the Metallic Compression Casting Company, Boston Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Four patents.
4,101 to 4,103.—DOOR KNOB ROSE.—Ludwig Kreuzinger, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Three patents.
4,104 to 4,106.—ESCUTCHEON.—Ludwig Kreuzinger, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Three patents.
4,107.—DOOR KNOB.—Charles Kunze, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,108.—DOOR KNOB.—Joseph L. Leger, Somerville, assigno to the Metallic Compression Casting Company; Boston, Mass., assigno to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,109 and 4,110.—BELL-PULL KNOB.—J. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Two patents.
4,111 and 4,112.—BELL-PULL BACK PLATE.—Joseph A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Two patents.
4,113 to 4,118.—DOOR KNOB.—Joseph A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Six patents.
4,119.—DOOR KNOB ROSE.—J. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,120.—DOOR BUTT.—J. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,121 and 4,122.—ESCUTCHEON.—Jos. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Two patents.
4,123.—DOOR LATCH.—Jos. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,124 to 4,126.—SHUTTER KNOB.—Jos. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Three patents.
4,127.—SHUTTER BAR.—Jos. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,128.—SASH LIFT.—J. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,129 and 4,130.—BELL-PULL KNOB.—John Joseph C. Smith, Somerville, assignor to the Metallic Compression Casting Company Boston, Mass., assignor to Russell & Erwin Manufacturing Company New Britain, Conn. Two patents.
4,131 to 4,138.—DOOR KNOB.—John. J. C. Smith, Somerville, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Eight patents.
4,139 and 4,140.—FLOOR CLOTH PATTERN.—J. T. Webster, New York city, assignor to Page, Wilder & Co., Hallowell, Me. Two patents.
4,141.—GRINDING MILL STAND OR FRAME.—John G. Baker, Philadelphia, Pa.
4,142.—HAND STAMP.—S. J. Hoggson, New Haven, Conn.
4,143.—THUMB OF GLOVE.—Edward Hulbert, Wm. F. Steele, and Henry C. Day, Gloversville, N. Y.
4,144.—TILE.—Wm. H. Humphrey, Lansingburg, N. Y.
4,145.—BAND SAW FRAME.—John Richards, Philadelphia, Pa.
4,146.—COLLAR BOX.—Geo. K. Snow, Watertown, Mass.
4,147.—CIDER, WINE, AND OTHER PRESSES.—Hermon Thomas, Philadelphia, Pa.

EXTENSIONS.

ELASTIC BOTTOMS FOR CHAIRS AND OTHER ARTICLES.—Lysander Spooner, Boston, Mass.—Letters Patent No. 15,021, dated June 3, 1856.

COUPLING FOR VEHICLES.—Harvey Miner aud H. M. Stevens, of New York city, and Mary Saunders, of Hastings, N. Y. (executrix of Wm. H. Saunders, deceased).—Letters Patent No. 14,985, dated May 27, 1856.

NAIL MACHINE.—Daniel Dodge, of Keesville, N. Y.—Letters Patent No. 15,054, dated June 3, 1856.

REAPING MACHINE.—W. C. Martin, Westville, Ind., administrator of Jacob J. Mann, deceased, and Henry F. Mann, of Pittsburgh Pa.—Letters Patent No. 15,044, dated June 3, 1856.

NEW BOOKS AND PUBLICATIONS.

THE SHEET METAL WORKER'S INSTRUCTOR. For Zinc, Sheet Iron, Copper, and Tin Plate Workers and others; containing a Selection of Geometrical Problems, also Practical and Simple Rules for Describing the various Patterns required in the different branches of the above Trades. By Reuben Henry Warn, Practical Tin Plate Worker. To which is added an Appendix, containing Instructions for Boiler Making, Mensuration of Surfaces and Solids, Rules for Calculating the Weights of different Figures of Iron and Steel, Tables of the Weights of Iron, Steel, etc. Illustrated by Thirty-two Plates and Thirty-seven Wood Engravings. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. Price, by mail, free of postage, $3·00.

This enterprising publisher evidently intends to supply every branch of industrial arts with an appropriate work of reference and guide. The book under present consideration is, so far as we are aware, the only one published upon sheet metal working in the English language, which treats its subject scientifically, practically, and accurately. It is an American edition of an English work, of well-recognized and standard merit. The present edition includes all the matter contained in the English edition and has added to it an important and useful appendix, including instructions for boiler making, mensuration of surfaces, tables, etc., very useful for reference. The book is thoroughly indexed, which adds greatly to its convenience in use. It is printed in bold clear type, and its contents are so well classified that it cannot fail to be a most useful hand-book for artizans in sheet metal.

CONTRIBUTIONS TO THE THEORY OF NATURAL SELECTION. A Series of Essays. By Alfred Russell Wallace, author of "The Malay Archipelago," etc., etc. Macmillan & Co., London, and 63 Bleecker street, New York city.

This book merits an elaborate review, and we have kept it upon our table for some weeks, hoping to gain leisure to give it a thorough reading and to place in the form of a review its salient points before our readers. We have not yet found time to do this, but we can assure all lovers of natural history, and all who delight in original investigation of the kind, that no time can be better improved than by the perusal of this work. The author candidly and modestly sets forth his claims to the origination of the origin of species, while acknowledging that few men but Mr. Darwin—and perhaps none now living—could have accomplished the great work from which that great philosopher derives his fame. The book is therefore written in no spirit of rivalry or detraction, but with an earnest desire to advance true science. The author takes issue with Mr. Darwin and others upon the origin of the human species. And his remarks upon this subject are full of facts of great interest. The book is a small octavo printed in handsome style on tinted paper and tastefully bound.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

HARVESTING MACHINES.—William A. Kirby, Auburn, N. Y., has applied for an extension of the above patent. Day of hearing Aug. 17, 1870.

DESIGN FOR A KNIFE OR FORK HANDLE, ETC.—Egbert W. Sperry, Wolcottville, Conn., has applied for an extension of the above patent. Day of hearing Oct. 12, 1870.

DESIGN FOR A KNIFE, FORK, OR SPOON HANDLE.—Egbert W. Sperry, Wolcottville, Conn., has applied for an extension of the above patent. Day of hearing Oct. 12, 1870.

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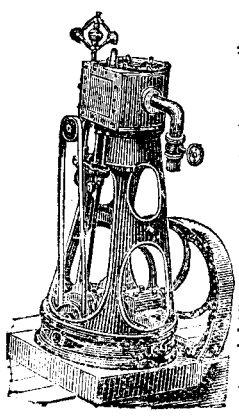

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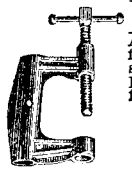

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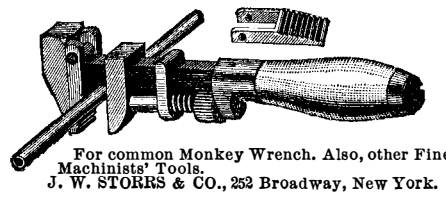

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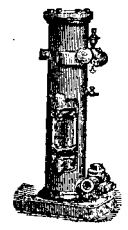

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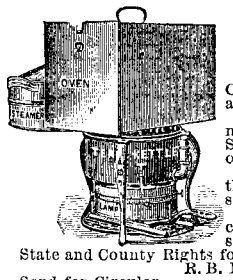

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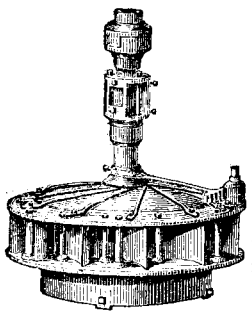

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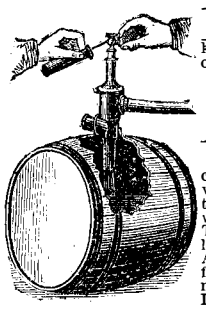

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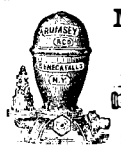

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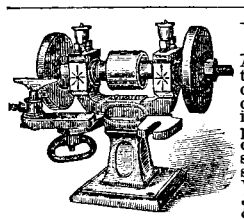

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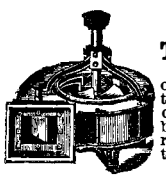

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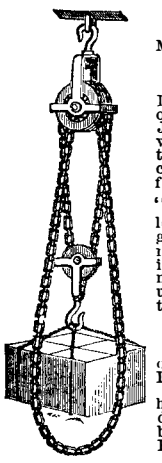

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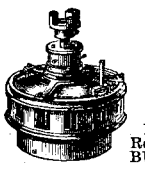

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